PC. 10
10,000

GOVERNMENT OF INDIA

PLANNING COMMISSION

सत्यमेव जयते

PROGRAMMES

OF

INDUSTRIAL DEVELOPMENT

1951-56

MADRAS INSTITUTE OF DEVELOPMENT STUDIES
(M. I. D. S.)
74, Second Main Road, Gandhinagar
MADRAS India

Price : Rs. 4-8 or 7sh.

FOREWORD

The factual data and statistical information regarding industries surveyed in this volume were mostly collected before August 1952. It is possible that in some instances they may be somewhat out-of-date owing to changes which have occurred since then, though, as far as possible, substantial changes, affecting the future position of industries, have been taken into account. It is hoped that in the annual reviews of the progress of the Five Year Plan it will be possible to present in broad lines, the latest position of the various industries in the light of the developments that may have taken place.

PROGRAMMES OF INDUSTRIAL DEVELOPMENT, 1951-56

TABLE OF CONTENTS

	Pages.
INTRODUCTION	1—10
A. METALLURGICAL INDUSTRIES	11—24
1. Iron and Steel	11
2. Aluminium	22
B. MECHANICAL ENGINEERING INDUSTRIES	25—82
3. Agricultural Implements and Machinery	25
4. Automobiles	37
5. Railway Rolling Stock	41
6. Shipbuilding	48
7. Machine Tools	53
8. Textile Machinery	61
9. Ball and Roller Bearings	67
10. Bicycles	71
11. Sewing Machines	75
12. Hurricane Lanterns	79
13. Grinding Wheels	81
C. ELECTRICAL ENGINEERING INDUSTRIES	83—116
14. Dry Batteries	83
15. Storage Batteries	87
16. Electric Cables and Wires	91
17. Electric Fans	96
18. Electric Lamps	99
19. Electric Motors	103
20. Electric Transformers	107
21. Radio Receivers	112
D. CHEMICAL AND ALLIED INDUSTRIES	117—190
22. Fertilisers	117
23. Heavy Chemicals	131
24. Drugs and Pharmaceuticals	149
25. Paints and Varnishes	157
26. Soap	161
27. Tanning and Footwear	165
28. Paper and Paper-board	171
29. Cement	178
30. Glass	184
E. LIQUID FUEL INDUSTRIES	191—203
31. Petroleum Products	191
32. Power Alcohol	197
F. TEXTILE INDUSTRIES	204—235
33. Cotton	204
34. Jute	216
35. Rayon	222
36. Woollen Manufactures	230
G. TIMBER INDUSTRIES	236—246
37. Matches	236
38. Plywood	240
H. FOOD INDUSTRIES	247—275
39. Salt	247
40. Sugar	255
41. Vegetable Oils	262
42. Vanaspati	270

PROGRAMMES
OF
INDUSTRIAL DEVELOPMENT, 1951-56

INTRODUCTION

In this volume are gathered together the studies of 42 organised industries referred to in paragraph 27 of Chapter XXIX of the Report. All of them follow the same pattern. First, the past development of the industry is very briefly described and its present location, rated capacity and actual production, and the capital and labour employed in it are stated. Next, the raw materials which it requires are listed and their availability discussed. Information is then furnished of the extent to which its products are imported or exported and estimates given of the present and future demand for them. After this the main problems facing the industry are stated—unless it is fortunate enough to have none. Finally, the existing or proposed programmes of expansion, if any, are set forth and recommendations made for the further development or improvement of the industry and for solving its problems, so far as this is possible.

2. It is desirable to recall here what is stated in paragraph 28 of Chapter XXIX of the Report regarding the limitations of the estimates of annual rated capacity and of the level of demand contained in these studies. "Rated capacity", it is stated in the Report "is a complex technical concept which should take into account the design of the plant, the number of shifts per day in the case of plants adopting batch or discontinuous processes, and the number of working days per annum. Rated capacity has also to take into account the balance between the different sections in a given unit, the age of the plant and its condition. There have been no expert technical surveys of rated capacity in various lines so that estimates of the divergence between rated capacity and actual production have to be used with caution . . . . . . The limitations in regard to the estimates of demand arise from the difficulty of assessing with reasonable certainty the requirements of consumption in various lines particularly where there is uncertainty about the availability of competing commodities. Estimates of demand over a period of years can only be approximations stating broadly the requirements that might be expected to develop on the assumption that relative prices do not change violently. It is also to be borne in mind that given the requirements of consumption for a particular product, the extent to which it will be met from imports can be indicated only roughly. Estimates of current and future consumption have been taken wherever possible from the reports of the Tariff Board and official publications have been relied upon for estimating imports. In several cases, however, imports of commodities like sulpha compounds, penicillin, D. D. T. and several engineering products are not shown separately in the official publications, and in some cases, since figures are stated in terms of value, it was difficult to get an idea of the categories and quantities imported."

3. These studies reveal in some detail the large number of new industries which have grown up in this country during and since the last war. Most people are aware, in a general way, that there has been a good deal of industrial expansion, but few have precise information regarding the fields where this has taken place. These studies to some extent provide it. While both established industries, *e.g.*, iron and steel, cotton textiles, paper,

and cement, and others less well established, *e.g.*, chemicals and pharmaceuticals, received a fillip from the increased demands made upon them during and immediately after the war, a whole range of new industries have come into existence, *e.g.*, the locomotive, shipbuilding, bicycle, automobile, diesel engine, electric motor, machine tools, textile machinery, ball and roller bearing, radio receiver, and rayon industries. It must, however, be emphasised that some of these are as yet delicate plants, which sprang up in favourable conditions of inflation and scarcity, and will need careful tending before they are firmly established. Furthermore, in spite of the expansion, India's industrial development is still backward, as may be gauged from the fact that only about 2·4 million or 1·8 per cent. of the working population are engaged in factory establishments.

4. Of the various problems confronting these industries, perhaps the most serious, and certainly the most universal, is the shortage or high price of raw materials. The largest industry of all, the iron and steel industry, suffers, no doubt, from lack of capacity and not from lack of raw materials; but the relative smallness of its output embarrasses a whole series of other industries for which iron and steel are raw materials. Several industries, *e.g.*, the jute, cotton textiles, paper and plywood industries, have been partially cut off by partition from the sources of supply of the raw materials which they consume. Others are handicapped by the country's deficiency in non-ferrous metals, and others, which require sulphuric acid as a raw material, by the world shortage of sulphur. It is of considerable importance that the country should overcome these shortages by developing new or alternative sources of supply. In this connection the manufacture of sulphur from gypsum, the use of cottonseeds by the vegetable oil industry, the exploitation of the fir forests in the remoter Himalayas for the production of newsprint and of chemical pulp for the rayon industry, are lines of possible development which deserve immediate attention.

5. Another disadvantage from which several industries suffer is that some of the units are of too small a size to be really economic. This is conspicuously true of the cotton textile and sugar industries. There are others, *e.g.*, the aluminium and cement industries, which suffer from the same defect in a greater or less degree. In these industries it is more important to bring the existing units to an economic size and to renovate and modernise the plants than to establish entirely new units.

6. The general order of priorities to be followed in the industrial field during the period of the Plan is given in Chapter XXIX of the Report and may be conveniently repeated here:—

(1) Fuller utilisation of existing capacity in producer goods industries like jute and plywood and consumer goods industries like cotton textiles, sugar, soap, vanaspati, paints and varnishes;

(2) Expansion of capacity in capital and producer goods industries like iron and steel, aluminium, cement, fertilisers, heavy chemicals, machine tools, etc.;

(3) Completion of industrial units on which a part of the capital expenditure has already been incurred; and

(4) Establishment of new plants which would lend strength to the industrial structure by rectifying as far as resources permit the existing lacunæ and drawbacks, *e.g.*, manufacture of sulphur from gypsum, chemical pulp for rayon, etc.

7. It will be seen that according to this scheme of priorities an increase in the supply of consumer goods has to come mainly from fuller utilisation of existing capacity and that the setting up of new plant and machinery for these industries has for the present a low

priority. By and large the capacity of industries producing cotton textiles, sugar, salt, matches and soap is considered adequate for present requirements and the emphasis must be on increasing the efficiency and output of existing plants. In the case of more durable consumer goods, *e.g.*, radios, bicycles, electric fans, etc., the emphasis must be on utilising the existing capacity to the full, developing units to the minimum economic size and promoting a progressive change-over from mere assembly to manufacture.

8. On the other hand actual expansion of capacity in capital and producer goods industries is necessary both in order to meet additional demands on them on account of the development of agriculture, irrigation and electricity, but also to establish a better balance in the industrial structure. Iron and steel are of basic importance to development whether in agriculture, industry or transport, and they are also essential for defence. The expansion of the iron and steel industry has, therefore, been given the highest priority. Industries producing capital goods like locomotives, heavy electrical machinery, machine tools, and textile machinery, and industries manufacturing agricultural implements, diesel engines and pumps and thus contributing directly to agricultural development, are receiving and must continue to receive increasing attention. The cement and fertilisers industries also rank high in importance.

9. A distinction has been drawn between the public and the private sectors of industry. The State, in the form of the Central or State Governments or other public authorities, already owns a number of industrial enterprises in various fields and reserves certain industries, such as the manufacture of arms and ammunition, exclusively to itself. In the case of certain other industries, *e.g.*, coal, mineral oils, iron and steel, aircraft manufacture, shipbuilding, the manufacture of telephone, telegraph and wireless apparatus, the State is in future to be responsible for further development except to the extent that the co-operation of private enterprise is from time to time considered necessary. The rest of the industrial field is left open to private enterprise, individual as well as co-operative, but regulation and control by the Central Government is envisaged for certain industries of special importance and the State will intervene whenever the progress of any industry under private enterprise is found to be unsatisfactory.

10. The programme of expansion proposed for the public sector of the industrial field is given in Appendix I. The total estimated expenditure on projects both of the Central Government and of the States amounts to Rs. 94 crores, about Rs. 83 crores of which is in respect of projects directly under the Central Government. The participation of private capital, indigenous as well as foreign, is envisaged in respect of certain of these projects. The estimated contribution of such private capital is about Rs. 20 crores.

11. The major industrial project in the public sector is one for a new iron and steel plant estimated to cost Rs. 80 crores in all and Rs. 30 crores during the period of the Plan. The estimated capacity of this plant will be about 800,000 tons of pig iron and at least 350,000 tons of steel. The Plan also provides for the completion of the Chittaranjan locomotive factory at Mihijam, West Bengal and of the machine tool factory at Jalahalli in Mysore State, for the expansion of the Sindri fertiliser factory and for the acquisition and development of the Vishakhapatnam shipbuilding yard. Some investment on a project for the manufacture of heavy electrical plant and equipment is envisaged towards the end of the period of the Plan. It is also proposed to set up Pencillin and D. D. T. factories.

12. Among the projects of the State Governments, the Madhya Pradesh newsprint project, designed to produce 30,000 tons of newsprint annually, and the expansion of the

Mysore Iron and Steel Works, designed to produce an additional 60,000 tons of finished steel by using for the first time in this country the technique of electric smelting of iron ores, are the most important.

13. The programme of expansion in the private sector is set out in Appendix II. The total capital investment required for carrying out this programme is estimated to be Rs. 233 crores exclusive of Rs. 150 crores estimated to be required for the replacement and modernisation of plant and machinery. About 80 per cent. of this investment will be in respect of capital goods and producer goods industries. The major part of it will be in the iron and steel industry (Rs. 43 crores), petroleum refineries (Rs. 64 crores), cement (Rs. 15·4 crores), aluminium (Rs. 9 crores) and fertilisers, heavy chemicals and power alcohol (Rs. 12 crores). It must be remembered, however, that in the private sector, while the Government can influence, it cannot determine the actual course of investment. The programmes proposed for the various industries (which have been worked out in close consultation with representatives of the industries concerned) are, therefore, in the nature of best judgments of what is feasible and desirable. The ability of private industry to fulfil these programmes will depend very largely on the availability of the necessary finance. A part of the finance required for the expansion of existing units manufacturing iron and steel is being made available by the Central Government directly through loans and indirectly through price increases. Additional financial assistance to this industry is also envisaged from World Bank loans. In certain fields such as petroleum refining and aluminium production, foreign capital will supply a major portion of the funds. It is also intended that the resources raised directly by private enterprise for industrial expansion should be supplemented by loans from the Industrial Finance Corporation at the Centre and similar institutions which exist in some of the States. The methods by which private industry can be enabled to finance the urgently required replacements of worn-out plant and machinery are receiving the attention of the Government.

14. Taking both the public and private sectors of industry together, about 26 per cent. of the total investment in the period of the Plan is to go into the metallurgical industries, (iron and steel and aluminium) 20 per cent. into petroleum refining, 16 per cent. into engineering industries, and 8 per cent. into the manufacture of heavy chemicals, fertilisers and pharmaceuticals. Relatively smaller investments are envisaged in other industries the textile industry (cotton, jute, rayon and wool) accounting for about 6 per cent., cement for about 5 per cent. and paper, paper board and newsprint for about 4 per cent. The production of major producer and capital goods would register increases as under :—

1. Heavy Chemicals (Sulphuric acid, caustic soda and soda ash)	'000 Tons	156·0
2. Fertilisers (Ammonium sulphate and superphosphate)	'000 Tons	528·6
3. Iron and Steel—		
(a) Pig Iron (available for foundries)	'000 Tons	310·0
(b) Steel	"	394·0
4. Aluminium	'000 Tons	8·3
5. Cement	'000 Tons	2,108·0
6. Locomotives	Numbers	150 (*plus* 50 boilers)
7. Diesel engines	Numbers '000	44·5
8. Powerdriven pumps	"	45·7 to 50·7
9. Carding engines	Numbers	600
10. Spinning Ring-frames	"	440
11. Plain, semi and automatic looms	"	4,100

15. In respect of consumer goods substantial increases in production are expected in cloth, sugar, paper and paper board, salt, sheet glass and vegetable oils as shown below:—

Cloth	Million yards	1,872
Sugar	'000 Tons	384
Salt	,,	429
Paper and paper board	,,	86
Sheet glass	,,	20
Vegetable oils	,,	182

Increases are also expected in respect of durable consumer goods like bicycles and sewing machines, and of insecticides (benzene hexachloride and D. D. T.), antibiotics (penicillin, aureomycin, etc.) and other synthetic drugs.

16. Before the war there were no significant exports of manufactured goods from India except jute goods, cotton manufactures, tanned or dressed hides and skins and leather, vegetable oils, woollen manufactures (carpets) and coir manufactures. Since the war the volume of exports of some of the above manufactures has shown significant expansion, *e.g.*, cotton textiles. There have also been exports of some new manufactured products like rayon fabrics, sewing machines, batteries, fans, pharmaceuticals, matches, cement, showing the beginnings of a diversification of export trade. The new trend of the last four years has resulted mainly from the favourable conditions created by the backlog of demand left over from the war and the temporary absence of Japanese competition. Partition has also changed the nature and volume of export trade to some extent. It is desirable that the new trend should, if possible, be maintained and strengthened and this is envisaged in the industrial plan. In regard to certain commodities export targets have been indicated for 1955-56 in the table below which are considerably in excess of current levels. Their achievement will involve large-scale modernisation of plant and improvement in techniques and in the quality of the finished products. Diversification of export trade is also envisaged to be achieved as a consequence of industrial developments that will be completed during the period of the Plan.

Export targets of principal manufactures

	Unit	1949-50	1950-51	1955-56
Cotton textiles—				
Cloth	Million yards	709	1,285	1,000
Jute manufactures	'000 tons	787	650	1,000
Glass—				
(i) Sheet glass	,,	..	..	8
(ii) Blown and pressed-wire	,,	..	..	8
Cement	,,	..	29	300
Bicycles	Numbers	..	..	30,000
Sewing machines	,,	1,000	3,000	11,500
Batteries—				
(i) Storage	,,	*N.A.*	*N.A.*	50,000
(ii) Dry cells	Millions	*N.A.*	*N.A.*	20·0
Electric fans	Numbers	*N.A.*	*N.A.*	30,000
Rayon fabrics	Million yards	12·23	6·99	10
Sugar	'000 tons	7·2	2·5	10
Vegetable oils	,,	45	120	170
Rare earth compounds	Rs. crores	..	..	1·0

N.A.—Not available.

17. In the preparation of the development plans collected in this volume the Commission has received valuable assistance from associations of industries, from Ministries of the Central and State Governments, from the Tariff Commission, and from independent specialists. Particular mention must be made of the active co-operation of the Development Wing of the Ministry of Commerce and Industry. The Commission desires to acknowledge with thanks the help rendered by these various agencies.

APPENDIX I

INDUSTRIAL PROJECTS IN THE PUBLIC SECTOR

Projects	Investment up to 1st April 1951 (Rs. lakhs)	Investment during 1951-56		1951-56 (Total for 5 years) (Rs. lakhs)	Year of completion of the project	New or additional capacity (per annum) by 1955-56
		1951-52 (Rs. lakhs)	1952-53 (Rs. lakhs)			
1	2	3	4	5	6	7
I. Central Government—						
1. Iron and Steel Project	..	..	50·0	30,00·0	1957-58	350,000 tons of pig iron by 1955-56.
2. Shipbuilding	150*	231·6	282·0	14,08·0	1956-57	50,000 DWT.]
3. Machine Tool Factory	14·2	98·0	150·0	9,63·8	1953-54	1,600 units.
4. Sindri Fertiliser Factoty.	18,41·2	435·0	3,00·0	9,03·0	Oct. 1951	350,000 tons of ammonium sulphate.
5. Chittaranjan Locomotive Factory.	10,20·0	2,82·0	1,91·0	4,73·0	Manufacture has started.	100 locomotives.
6. Railway Coach Factory.	..	6·5	120·0	4,00·0	1955	50 units.
7. Penicillin Factory	4·4	17·7	60·0	2,06·6†	1954	4·8 million mega units.
8. National Instruments Factory.	4·0	14·5	25·0	1,82·0	Production has started.	Additional Rs. 64·4 lakhs worth of instruments.
9. Indian Telephone Industries.	1,20·0	65·0	33·0	1,30·0	Assembly has started	Rs.2,00 lakhs worth of telephones and other articles.
10. Hindustan Cables Ltd.	0·3	23·1	70·0	1,29·7	1953-54	Rs. 100 lakhs worth of cables.
11. Mandi Salt Works	..	..	10·0	1,00·0	1954	61,000 tons of salt.
12. Rare Earth Factory	26·0‡	*N.A.*	*N.A.*	54·0	June 1952	800 tons of rare earth compounds and 202 tons of thorium compounds in terms of thorium nitrate.
13. D.D.T. Factory	..	..	5·0	39·1§	1954	700 tons.
14. Existing Salt Works	3·7	4·3	8·0	50·0	1955-56	About 368,000 tons of salt.
15. Housing Factory	93·7	9·8	2·0	11·8	1952-53	..
16. Other Projects ‖	*N.A.*	*N.A.*	*N.A.*	2,02·1	1955-56	..
Total	32,77·5	11,87·5	13,06·0	82,53·1		..

*Represents the investment of Central Government only.
†Including Rs. 57·0 lakhs from WHO and UNICEF.
‡Investment up to the end of 1951.
§Including 350,000 U.S. Dollars from WHO and UNICEF.
‖Including, *inter alia*, Nasik Printing Press, Silver Refinery and New Mint (Alipore).
N.A.—Not available.

APPENDIX I—*contd.*

Projects	Investment up to 1st April 1951 (Rs. lakhs)	Investment during 1951-56: 1951-52 (Rs. lakhs)	Investment during 1951-56: 1952-53 (Rs. lakhs)	1951-56 (Total for 5 years) (Rs. lakhs)	Year of completion of the project	New or additional capacity (per annum) by 1955-56
1	2	3	4	5	6	7
II. State Government—						
1. Mysore Iron and Steel Works.	2,16·0	40·0	125·0	283·0	1954-55 . .	Additional 60,000 tons of finished steel.
2. U. P. Government Cement Factory.	1,52·8	65·0	124·6	230·5	1953-54 . .	200,000 tons.
3. NEPA Mills . .	2,24·9	91·4	82·0	200·0	1954 . .	30,000 tons of newsprint (300 working days).
4. Sirsilk Ltd† .	3,81·0	65·6* (items 4 and 5)	90·0* (items 4 and 5)	200·0	1953-54 . .	16·5 million yards of art silk (330 working days).
5. Sirpur Paper Mills .	2,03·0			60·0	1953-54 . .	Additional 8,000 tons.
6. U. P. Precision Instruments Factory.	14·1	9·8	7·3	50·2	Expansion . .	12,000 watermeters and 300 microscopes.
7. Bihar Government Superphosphate Factory.	1·3	11·7	40·0	41·1	1953-54 . .	16,500 tons of superphosphate (330 working days).
8. Other Projects .	*N.A.*	*N.A.*	*N.A.*	65·0‡	1955-56	..
Total .	11,93·1	283·5	468·9	11,29·8	..	..
GRAND TOTAL .	44,70·6	14,71·0	17,74·9	93,82·9	..	..

*Includes expenditure on Singarani Collieries Ltd.
†Provision in the Hyderabad State Plan for this project amounts to Rs. 85·7 lakhs.
‡Including Rs. 40·0 lakhs for the D.D.T. Factory in the Bombay State Plan.
N.A.—Not available.

APPENDIX II

EXPANSION PROGRAMMES IN THE PRIVATE SECTOR

Industries	Unit	*1950-51* Rated capacity	*1950-51* Production	*1955-56* Rated capacity	*1955-56* Production	Capital investment 1951-56 (Rs. lakhs)
A. *Metallurgical*—						
1. Iron and Steel—						
(i) Pig Iron	Tons '000	1,850	(*d*) 1,572	(*e*) 2,700	1,950	43,00
(ii) Finished steel (Main Producers only).	,,	975	(*d*) 976	(*e*) 1,550	1,280	..
2. Aluminium	Tons	4,000	3,677	20,000	12,000	(*b*) 900
B. *Mechanical Engineering* (*a*)—						
3. Agricultural Implements and Machinery—						
(i) Pumps (Power driven centrifugal).	Numbers	33,460	34,310	69,400	80,000 to 85,000	1,20 (for (i) and (ii))
(ii) Diesel engines . . .	,,	6,320	5,540	39,725	50,000	
4. Automobiles (*c*) (Manufacturing only).	,,	30,000	4,077	30,000	30,000	3,00
5. Railway Rolling Stock—						
(i) Locomotives . . .	,,	*N.A.*	*N.A.*	50 (*plus* 50 boilers)	50 (*plus* 50 boilers)	2,50
(ii) Underframes . . .	,,	*N.A.*	*N.A.*	400	400	..
6. Machine tools (graded) . .	,,	3,000	(*f*) 1,101	3,000	3,000	20
7. *Textile Machinery*—						
(i) Carding engines . .	,,	600	..	600	600	..
(ii) Spinning ring frames .	,,	396	260	800	700	..
(iii) Looms, plain, semi and automatic.	,,	3,600	1,894	8,000	6,000	..
8. Ball and roller bearings .	Numbers '000	600	87	1,200	1,200	(*g*) 525
9. Bicycles	,,	120	101	530	530	..
10. Sewing Machines . . .	Numbers	37,500	32,965	91,500	91,500	..
11. Hurricane Lanterns . .	Numbers '000	4,260	3,240	4,510	6,000	..
12. Grinding Wheels . . .	Tons	360	231	840	750 to 800	..

(*a*) The development programme for shipbuilding industry is also covered in this group. No mention of it has been made in this table because the industry is in the public sector.
(*b*) Covers only what is expected to be spent during the period of the Plan.
(*c*) Based on the programme of the two existing manufacturers.
(*d*) Including the output of the Mysore Iron and Steel Works.
(*e*) The rated capacity will be achieved when the expansion of projects are completed, *i.e.*, by 1957-58.
(*f*) Figure relates to calendar year, 1950.
(*g*) Covers the other light engineering industries referred to under serial numbers 9 to 20 also.
N.A.—Not available.

APPENDIX II—*contd.*

Industries	Unit	1950-51 Rated capacity	1950-51 Production	1955-56 Rated capacity	1955-56 Production	Capital investment 1955-56 (Rs. lakhs)
C. *Electrical Engineering—*						
13. Dry Batteries . . .	Numbers '000	285,000	136,500	310,000	320,000	..
14. Storage Batteries . . .	Numbers '000	446	200	538	400	..
15. Electric cables and wires A. C. S. R. cables.	Tons	2,500	1,674	5,000	5,000	..
16. Electric Fans . . .	Numbers '000	288	194	360	320 to 350	..
17. Electric Lamps—						
(i) G. S. L. lamps . . .	,,	23,000	15,000	32,000	30,000	..
(ii) Miniature lamps . .	,,	900	*N.A.*	27,500	16,000	..
18. Electric Motors . . .	H.P. '000	150	99	300	320	..
19. Electric Transformers . .	K.V.A. '000	370	179	485	450	..
20. Radio Receivers . .	Numbers '000	77	49	380	350	..
D. *Chemical and Allied—*						
21. Fertilisers—						
(i) Ammonium Sulphate .	Tons	78,670	46,304	131,270	120,000	210 (for items (i)–(ii))
(ii) Superphosphate . .	,,	123,460	55,089	192,855	164,000	
22. Heavy Chemicals—						
(i) Sulphuric acid . .	Tons '000	150	99	230	192	730 (for items (i)–(iii))
(ii) Soda ash . . .	,,	54	45	86	78	
(iii) Caustic soda . . .	,,	19	11	37	33	
23. Drugs and Pharmaceuticals—						
(i) Benzene hexachloride .	Tons	..	..	500	500	350 (for items (i)–(iv))
(ii) Sulpha drugs . . .	Lbs. '000	..	..	400	400	
(iii) Para amino-salicylic acid	Tons	..	..	48	48	
(iv) Calcium lactate . .	,,	..	..	50	50	
24. Paints and Varnishes—						
(i) Ready mixed paint, varnish, etc.	Tons '000	65	29	70	60	50 (for items (i)–(iv))
(ii) Pigment (Titanium dioxide).	Tons	..	..	1,800	1,800	
(iii) Nitro-cellulose lacquers .	Gals. '000	..	..	350	300	
(iv) Aluminium paste and powder.	Tons	..	..	750	750	
25. Soap	Tons '000	265	106	280	200	60 (includes glycerine)
26. Tanning and Footwear .	Million pairs	..	85	..	91	60

APPENDIX II—*concld.*

Industries	Unit	1950-51 Rated capacity	1950-51 Production	1955-56 Rated capacity	1955-56 Production	Capital investment 1955-56 (Rs. lakhs)
D. *Chemical and Allied*—contd.						
27. Paper and Paper-board—						
(i) Paper and paper-board .	Tons '000	137	(*h*) 114	198	188 }	5,35
(ii) Strawboard and other boards	,,	48	22	58	53 }	
28. Cement	Tons '000	3,194	(*h*) 2,692	5,016	4,515	15,40
29. Glass and Glassware—						
(i) Sheet glass . . .	Tons	11,700	5,850	52,200	26,000 }	220
(ii) Blownware and pressedware	,,	201,550	86,000	237,800	137,500 to 142,500 }	
(iii) Bangles	,,	35,000	16,000	35,000	16,000 }	
E. *Liquid Fuels*—						
30. Petroleum products .	(In terms of input of crude oil '000 tons)	250	..	(*i*) 2,000	..	64,00
(i) Liquid petroleum products	Gals. million	*N.A.*	*N.A.*	*N.A.*	(*j*) 403	..
(ii) Bitumen	Tons	*N.A.*	*N.A.*	*N.A.*	37,500 (*j*)	..
31. Power Alcohol—						
(i) Power alcohol . . .	Gals. million	13	5	21	18	(*k*)120
(ii) Commercial spirit . .	,,	3	*N.A.*	3	2	..
F. *Textile* —						
32. Cotton—						
(i) Yarn	Lbs. million	1,669	1,179	1,722	1,640 }	900
(ii) Cloth (mill made) . .	Yds. million	4,744	3,718	4,779	4,700 }	
(iii) Cloth (Handloom) . .	,,	(*l*) 3,000	810	3,000	1,700 }	
33. Jute	Tons '000	1,200	892	1,200	1,200	..
34. Rayon—						
(i) Rayon Filament . .	Lbs. million	4	1	18	18	15,10
(ii) Staple fibre . .	Bales '000	..	..	28	28	..
(iii) Cotton Linters . .	Lbs. million	..	..	5	5	..
(iv) Chemical pulp . .	Tons	..	..	(*q*) 11,500	*N.A.*	..
35. Woollen	Lbs. '000	20,150	18,000	(*m*) 20,150	(*m*)25,000	..
G. *Timber*—						
36. Match	Gross boxes '000	35,300	29,100	38,300	35,300	50
37. Plywood Tea chest . .	Sq. ft. '000	138,840	4,940	180,000 to 190,000	100,000	60
H. *Food*—						
38. Salt (*n*)	Tons '000	2,270	1,920	4,026	2,186	*N.A.*
39. Sugar	,,	1,540	(*o*) 1,116	1,550	1,500	10
40. Vegetable oils	,,	*N.A.*	(*p*) 1,118	*N.A.*	1,299	60
41. Vanaspati	,,	333	153	389	300	50
TOTAL .		..	..	..	..	233,30*

*Includes Rs. 38,00 lakhs investment on other schemes including power generation in the private sector.

(*h*) Actual production includes the output of the factory in the public sector.

(*i*) Rated capacity will reach 3·45 million tons in terms of input of crude oil by 1956-57 when the two refineries are expected to be in full production.

(*j*) Exclusive of the existing capacity.

(*k*) Includes expenditure for creating facilities for petrol-alcohol mixture.

(*l*) Rated capacity of handlooms is based on the number of handlooms in existence at present and availability of yarn at the rate of 20 lbs. per month.

(*m*) Figures for rated capacity as well as production do not take into account the installation of 30,000 spindles for fine woollen yarn.

(*n*) Figure relating to rated capacity (*i.e.*, potential production capacity) and actual production of salt in the private sector have been estimated, except for the industry's total capacity of 4,026 million tons by 1955-56 (including the capacity in the public sector) which has been estimated by the Salt Experts Committee.

(*o*) Figure relates to the sugar season 1950-51.

(*p*) Production figure for vegetable oils, excluding coconut oil, relates to the year 1949-50.

(*q*) Construction will be almost complete so that the actual production is assumed negligible.

N.—Negligible.

N.A.—Not available.

A. Metallurgical Industries

1. IRON AND STEEL

The iron and steel industry was the first to benefit from the policy of discriminating protection. The industry has progressed sufficiently to be able to withstand foreign competition, at any rate, in basic steel. India is at present one of the cheapest producers of steel in the world.

The iron and steel producers are usually classified under two categories, namely, the *main producers*, who convert iron ore into steel and are equipped also for rolling it into finished products and the *re-rollers* who manufacture finished steel from billets supplied by the main producers or imported from abroad, and by using scrap. The main producers, however, constitute the predominant section.

MAIN PRODUCERS

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There are at present three main producers of iron and steel, *viz.*, the Tata Iron and Steel Co., the Indian Iron and Steel Co. (associated with the Steel Corporation of Bengal) and the Mysore Iron & Steel Works. The Tata Iron & Steel Co. has an integrated plant which produces all the pig iron it needs while the Indian Iron & Steel Co. and the Steel Corporation of Bengal, in spite of being two separate units, have a working agreement whereby the former supplies to the latter all the hot metal it requires. The Mysore Iron & Steel Works at Bhadravati is a comparatively small unit owned and managed by the Mysore State. The total capacity of the main producers for pig iron and finished steel is estimated to be 1,878,000 and 1,050,000 tons per annum respectively. The industry is mainly concentrated at the present time in Bihar and West Bengal in close proximity to coal and iron ore deposits.

The production of pig iron and finished steel in India recorded continuous progress and reached a maximum of 2 million tons of pig iron in 1941 and of 1·13 million tons of finished steel in 1943. Because of the intensive use of the plant and machinery during the war period and the lack of adequate replacements, the level of production went down in the subsequent period, but since 1948 the downward trend has been arrested and the output has recorded a perceptible increase. However, unless the arrears of replacements are wiped out and the plant and machinery are renovated, these units may not be able to maintain the present level of production for very long. Actual production of pig iron for sale to foundries and of steel by the three main producers since 1948 was as under:—

	Production of Iron and Steel	
	Pig Iron (For sale)	Finished Steel
	Tons	Tons
1948	356,398	853,815
1949	427,575	926,891
1950	290,457	976,100
1951	287,209	1,050,111

(b) *Capital and labour.*—The total capital invested by the main producers is estimated at about Rs. 61 crores and the skilled and unskilled labour employed at about 60,000.

(c) *Raw materials.*—The important raw materials of the industry are iron ore, coking coal, manganese ore, refractories made from magnesite, dolomite, chromite, fireclay, etc., and fluxing materials like, silica, limestone and fluorspar. Sulphur is also required for the manufacture of sulphuric acid which is required for fixing by-product ammonia as ammonium sulphate and for pickling of steel. Some idea of the proportion in which these materials are consumed in the process of steel making can be had from the following table :—

Raw material	Estimated consumption per ton of finished steel
	Tons
Coking coal	1·565
Iron ore	1·913
Manganiferrous ore and manganese ore	0·130
Blast furnace flux	0·509
Open Hearth flux	0·057
Ferro alloys	0·017
Raw dolomite	0·090
Burned magnesite	0·009
Refractory bricks	0·026
Other refractories	0·017
Steam coal	0·365

In regard to most of these raw materials, India enjoys a favourable position. The deposits of iron ore, which is the principal raw material of the industry, are plentiful and of a superior quality. The average iron content of the ore is between 60 and 69 per cent. as compared with 40 per cent. in Europe, and 50 per cent. in the United States. As the ore is generally mined open cast or by adit, the cost of extracting the ore is also comparatively small. The same is the case with manganese ore, magnesite and dolomite. But relatively to the supplies of iron ore, known reserves of coking coal are limited. They are estimated to be in the neighbourhood of 1,500 to 2,000 million tons. Although at present the industry is able to secure all the metallurgical coal it needs, the aggregate deposits being limited, it is necessary to take all possible precautions to prohibit its use for purposes where inferior types of coal could be used without any loss of efficiency. The principal raw materials for which India has to depend on foreign sources are spelter for galvanising, tin for tin plates, ferro-tungsten, nickel, chromium and fluorspar. Deposits of fluorspar are located in Madhya Pradesh but they are yet to be exploited. Excepting fluorspar, spelter and tin, these raw materials are required in small quantities. On the whole, the Indian iron and steel industry is very favourably situated in respect of the quality of its raw materials, their availability and price. As raw materials account for nearly 80 per cent. of the cost of pig iron and 60 per cent. of the cost of finished steel, they provide the explanation for the low cost of steel produced in India.

(d) *Imports and exports.*—With a view to meeting the requirements of iron and steel as much as possible, considerable quantities of steel have been imported into the country The quantity of steel imported in 1949 and 1950 was estimated to be 398,000 and 284,000 tons respectively. Imports dwindled to 178,000 tons of steel in 1951. Export of iron and steel is permitted only in small quantities when it is obligatory on account of bilateral trade agreements.

(e) *Estimated consumption and requirements*—(i) *Steel.* Although the production of steel has steadily increased during the last 30 years, the volume of consumption, depending as it does on the level of investment, the price of steel, and the availability of supplies, has recorded marked fluctuations. From 1·7 million tons in 1914 the consumption of steel dropped to 0·8 million tons in 1920, shot up to 2·2 million tons in 1928, declined again to 1 million tons in 1932 and rose to 1·6 million tons in 1940 during the war period and has remained round about that level since then.

In recent years, various estimates of the magnitude of normal demand for steel have been made. The Iron and Steel (Major) Panel, which in 1946 examined the prospects for the development of the steel industry in India, estimated that the normal consumption of steel in future would be about 2 million tons. The breakdown of the demand for steel, as estimated by the Panel, is given below:—

	Tons '000
Average pre-war consumption	1,000
Post-war Agricultural demand—	
(*a*) Agricultural implements	250
(*b*) Construction works	205
Post-war Railway Programme	300
Hydro-electric schemes	60
Roads	10
Consumption in Provinces	200
TOTAL	2,025

The Advisory Planning Board which submitted its report in the beginning of 1947, however, considered this estimate to be on the high side, particularly because of the provision made for agricultural requirements which the Board considered to be unduly large. According to its calculations, the normal demand for steel in the country was of the order of 1·5 million tons. In April 1950, the Sub-Committee on Iron and Steel of the Economic Commission for Asia and the Far East calculated that the probable demand for steel in India would be of the order of 2·9 million tons by 1954.

During the pre-war period, railways and building construction accounted for nearly 65 per cent. of the consumption of steel in the country. They still constitute the principal consumers of steel, but the large-scale programme of multi-purpose projects, the effort that is being made to develop intensive cultivation and the establishment of new steel consuming industries like the locomotive, automobile, shipbuilding, machine tools, textile machinery and engineering industries will require substantial quantities of additional steel. During the years 1948 and 1949 the quantity available for consumption (production *plus* imports *minus* exports) of finished steel and semis amounted to 1·06 million tons and 1·2 million tons respectively. On the basis of the demand made by the consumers of steel and screened by the Government, it is estimated that the total requirements of steel would come to about 2·3 million tons on an unrestricted basis in 1952 and to about

2·8 million tons by 1957. The demand for different categories of steel is visualised as under:—

Estimated demand for different categories of steel

	1952	1957
	Tons	Tons
Billets for re-rollers	*600,000*	*650,000*
Rails and structurals	*750,000*	*850,000*
Sheets	400,000	440,000
Bars and rods	650,000	800,000
Plates	200,000	300,000
Tin plates	130,000	140,000
Wires and wire products	40,000	50,000
Pipes and tubes	60,000	80,000
Wheel tyres and axles	50,000	60,000
Others	60,000	80,000
TOTAL	2,340,000	2,800,000

However, considering that it would not be possible to step up domestic production adequately or arrange for imports of adequate quantities of steel at a reasonable price during the period of the Plan, domestic consumption may have to be restricted in the coming years.

(ii) *Pig Iron.*—In addition to the pig iron required for the production of steel, the Iron and Steel (Major) Panel (1946) estimated the demand for pig iron for foundries at 300,000 tons per annum. A more recent estimate by the Panel on Light and Heavy Engineering Industries of the Ministry of Commerce and Industry (1951) has placed the present minimum requirements of pig iron at 400,000 to 420,000 tons, whereas the present screened demand is estimated at 600,000 tons per annum as given below:—

	Tons
Light Engineering Industries	350,000
I I S Co's Foundry	100,000
Government and Railway Workshops	50,000
Heavy Engineering Industries and Miscellaneous	100,000
TOTAL	600,000

On the basis of the expansion envisaged in various industries consuming pig iron, it is estimated that the demand for foundry pig iron will go up to 700,000 tons per annum by 1955-56.

II. Problems of the Industry

(a) *Finance.*—Notwithstanding the heavy demand for steel in the country and the natural advantages which the industry enjoys, no new undertaking for the manufacture of steel has been established in the post-war period. The main difficulty in the progress of the industry is finance. For assisting some measure of development, the Government have agreed to advance a loan of Rs. 5·0 crores to the SCOB and IISCo. A sum of Rs. 2·0 crores had been paid before 1st April 1951 and the balance will be paid by the end of 1953-54. The retention prices of steel have also been revised recently as a result of which the main producers will be in a position to finance a part of their developmental expenditure out of depreciation allowances granted by the Government.

(b) *Labour*.—Another problem with which the industry is confronted and which has adverse effects on the cost of production of steel, is the excessive number of workers which it employs. For several reasons the industry at present is not in a position to reduce the number of workers employed to a reasonable level. Since the advantages of cheaper steel are cumulative and far-reaching, it is desirable to bring down the price of steel as much as possible and for this purpose a curtailment of the present complement of labour is essential. This should be brought about in such a manner that the surplus labour may be absorbed by expansion schemes in the public and private sectors.

(c) *Metallurgical coal*.—India at present produces about 30 million tons of coal per annum and her aggregate resources are considered to be very large. Supplies of metallurgical coal, required for the production of steel, are, however, not unlimited. Large quantities of metallurgical coal are at present used by Railways, industries and by the collieries themselves, which could use ordinary coal without any appreciable loss of efficiency. The production of metallurgical coal amounts to nearly 10 or 11 million tons, while its consumption by the iron and steel industry is in the neighbourhood of 4 million tons. Roughly, therefore, 6 to 7 million tons of metallurgical coal are being wastefully used. If the limited resources of metallurgical coal are to be conserved, it means that some of the collieries which are producing this coal at present would have to be closed and new collieries which could meet the gap in the supply by mining ordinary coal would have to be opened. The whole question has been dealt with in greater detail under the policy relating to conservation of high grade coal. Conservation of coal would also be achieved if it is found possible after detailed examination to base pig iron production at least partly on the Krupp-Renn process operated by the Krupps organisation in certain countries. This process uses low grade coal and iron ore fines to produce iron nodules in rotary kilns which are subsequently refined to pig iron in an electric furnace. The adoption of this process might be examined in connection with new projects for pig iron production.

(d) *Off-grade Pig Iron*.—Two grades of pig iron—standard pig iron and off-grade pig iron—result from the manufacturing operations of the main producers. The off-grade pig iron is low in silicon and manganese and high in sulphur, and considerable difficulty is experienced by the foundries, particularly in the manufacture of durable consumer goods involving machining operations where off-grade pig iron is found to be unsuitable. The minimum requirements of light and heavy engineering industries for these two grades of pig iron have recently been estimated as follows :—

	Pig Iron requirements	
	Standard	Off-grade
	Tons	Tons
Light Engineering Industries	112,000	135,000
Heavy Engineering Industries	175,000	350
TOTAL .	287,000	135,350

In recent times the output of off-grade pig iron has increased at the expense of the standard grade. As a result the supplies of the latter have fallen off and the consumers are being allotted increasing quantities of off-grade material. By better control of operations this trend in the increased production of off-grade pig iron could be arrested and further, off-grade pig iron could be refined into the standard grade by laddle additions of ferro-silicon, ferro-manganese and fused soda ash briquettes. The producers have, however,

pointed out that the increased output of off-grade material in recent years is due to some of the following causes:—

(i) use of low grade iron ore;

(ii) irregular and insufficient supplies of suitable coking coals; and

(iii) furnace operation at full or higher than the rated capacities.

In view, however, of the importance of standard pig iron for the production of quality goods, Government have granted differential prices for various grades of pig iron as recommended by the Tariff Board.

III. Programme of Development

(a) *Existing programme.*—At the beginning of the period of the Plan the following programmes of expansion were under implementation:

(i) The Mysore Iron & Steel Works, who made a beginning with diversification of production in their works during the second world war, have taken up certain schemes for execution in the post-war period. These schemes covered expansion of cement production, and direct recovery of acetic acid from pyroligneous liquor obtained as a by-product of the wood distillation plant which are not directly related to increasing iron and steel production. Further the Company placed orders for the purchase of two electric pig iron furnaces each capable of producing 100-110 tons of pig iron per day and took effective steps for the expansion and modernisation of iron ore mines and extension of forest tramways to ensure an adequate supply of wood fuel and mineral raw materials. Being situated far away from centres of coal supply, the Company embarked on electric smelting of iron ore based on the utilisation of power available from the Jog Falls. By 1st April 1951, a sum of Rs. 2·16 crores was invested on all these schemes. For the completion of these schemes and certain additional projects considered desirable from the standpoint of diversification of steel production which would enable the operations to be carried on an economic basis, the Central Government may have to advance a loan of Rs. 2·82 crores during the period of the Plan which is envisaged to be spent as under:—

Scheme	Cost during the period of the Plan (Crores of Rs.)
Installation of 3 electric pig iron furnaces	1·15
Bessemer electric Duplex plant	·45
Billet and light structural mills	·85
Acetic acid plant	·03
Extension of cement plant	·10
Improvement to ore mines and tramways	·14
Improvement to shop, foundry, yard, etc.	·11

In so far as iron and steel products are concerned, the implementation of this programme which is expected to be achieved by the end of 1953, will result in increasing the production of finished steel from 40,000 to 100,000 tons.

(ii) *Expansion of SCOB-IISCo (First Stage).*—The Steel Corporation of Bengal and the Indian Iron & Steel Company have between them projects under execution which will increase the installed capacity for finished steel to 345,000 tons per annum by 1953-54. This expansion was undertaken by the SCOB-IISCo on the basis of the Central Government agreeing to advance a loan of Rs. 5·0 crores of which a sum of Rs. 2·0 crores had been paid by 1st April 1951. This project mainly covers extensions to the capacity of all the

mills of SCOB with necessary handling and finishing equipment and replacement of old coke oven batteries, erection of a new sulphuric acid plant and of mechanised equipment for the handling, crushing and screening of coal and coke at IISCo.

(b) *Expansion schemes projected*—

(i) *Expansion and modernisation programme of TISCo.*—The Tata Iron & Steel Company have formulated a programme of expansion and modernisation of their works at a total cost of about Rs. 22·71 crores apart from normal capital expenditure for replacements and maintenance of collieries and works, etc., which is estimated to cost an additional Rs. 10·21 crores. The Plan is envisaged to be implemented by the end of 1957 when the capacity for finished steel would increase to 931,000 tons. The expenditure on the modernisation plan is visualised as under:—

	Foreign exchange (Crores of Rs.)	Indigenous (Crores of Rs.)
Coke ovens	·46	·99
Blast furnace	·51	1·37
Melting shop	2·91	2·91
Blowing mill	1·64	1·0
Soaking pits	·27	·54
Plate mill	1·45	·50
Skelp mill	1·54	1·71
Tube mill	·45	·75
Calcining plant	·27	·14
Firebrick plant	·24	·47
Power plant	1·87	·73
TOTAL	11·61	11·10

The expenditure on the tube mill represents only a part of the total estimated at Rs. 2 crores, the balance of which would be advanced by Stewarts and Lloyds. Out of the total outlay of about Rs. 33 crores, TISCo hope to find about Rs. 22 crores from operations leaving a balance of Rs. 11 crores to be provided otherwise.

(ii) *Further Expansion of SCOB-IISCo.*—With a view to bringing their plant to the economic size and making the fullest use of the blooming capacity in existence, the SCOB-IISCo have formulated proposals which, on implementation, would enable them to produce an additional 350,000 tons of finished steel and 400,000 tons of foundry iron or alternatively an additional 270,000 tons of finished steel and 500,000 tons of foundry iron. The capital expenditure on the scheme is estimated at Rs. 31·7 crores spread over the period 1953-57 on the following items: Coke ovens (Rs. 5·93 crores); Blast furnaces (Rs. 9·02 crores); Melting shop (Rs. 6·2 crores); Rolling mills (Rs. 2·0 crores); Services (Rs. 3·5 crores) and Contingencies (Rs. 5·05 crores). Including the regular capital expenditure during this period, it is estimated that the aggregate financial investment would amount to Rs. 34·2 crores out of which the SCOB-IISCo could make available Rs. 8·4 crores from operations.

(c) *Recommendations*—

(i) *Financial assistance to main producers (TISCo and SCOB-IISCo) for the implementation of the expansion programmes.*—Against the background of the existing gap between demand and supply and the fact that expansion projects take less time and finance than a new project, it is necessary that the Government should accord high priority to facilitating the expansion schemes of TISCo and SCOB-IISCo described above.

The main bottleneck in the way of their implementation is lack of finance. Though the main producers would be able to find Rs. 30 crores from operations, about Rs. 42 crores more are required for achieving the expansions. The amount required is so large that it will have to be mobilised from more than one source by and with the assistance of the State. The Central Government have recently increased the selling prices of steel as a result of which additional funds would accrue to the Equalization Fund every year. A part of this money will have to be paid to the main producers as compensation for increased freight costs and for increased retention prices. It is recommended that the net additional resources resulting from the increase in the selling price of steel should be utilised for assisting the expansion projects of the TISCo and SCOB-IISCo. The quantum of assistance which could be rendered by this process without unduly straining the national economy is estimated at Rs. 20·0 crores. As regards the rate of interest on loans from the Equalization Fund and the terms thereof, the Government should examine the question with the steel companies. The creation of additional capacity for iron and steel in the country is so important that concessions on rates of interest should be given for a specific period if found necessary.

Apart from advances from the Equalization Fund and from operations, it will be necessary to secure additional funds of the order of Rs. 22·0 crores for the completion of the expansion schemes. The experts of the International Bank who have recently examined the schemes in consultation with the Central Government and the Companies consider them sound and worthy of being recommended to the International Bank for the grant of loans for their implementation. The Government should therefore give all possible assistance so that a substantial loan may become available from the International Bank. The balance of requirements should be met almost entirely from domestic borrowings restricting further Government assistance to the barest minimum.

(ii) The Tariff Board had recommended in its last enquiry into the retention prices of steel that the SCOB and IISCo should merge into a single company as that would lead to production of steel at lower cost. Considering the heavy financial assistance visualised for the implementation of their expansion scheme, the issue of merger should be settled at the earliest possible date.*

(iii) The financial assistance to the companies is of a magnitude which would justify the Government claiming a right to participate in the administration through its nominees functioning as Directors. Further as the Government might have to stand guarantee for the loans that may be advanced by the International Bank, it should provide in the loan agreements necessary arrangements to ensure its interests and commitments being properly safeguarded.

(iv) In connection with financial assistance to the Mysore Iron & Steel Works, the Government should constitute a special committee to go into the organisation and administration of the works and the projects on which commitments have not so far been made regarding the purchase of machinery. The extension of loan assistance should be linked up with the implementation of the recommendations of the committee.

(v) The re-rolling industry, as explained later, is handicapped for want of billets in maintaining continuous production even on a single shift basis at the present time. It is therefore important that future expansion of the iron and steel industry should provide for the production of an additional 150,000 to 200,000 tons of billets. The Government

---

*The Central Government have recently enacted legislation in place of an Ordinance issued to facilitate this merger.

should take up this question with the SCOB-IISCo in their negotiations regarding loan assistance and ensure that the extra output of billets is incorporated in their production programme.

(vi) The expansion of iron and steel production by the main producers would call for the creation of additional transport facilities for facilitating the movement of raw materials and finished products. Unless provision is made for this 'transport element', it is likely that transport would act as a bottleneck when the schemes are completed and the plants go into full production. The magnitude of these additional transport requirements in terms of line capacity, wagons and locomotives should be worked out by the Railway Ministry. It is estimated that in terms of financial investment, the creation of these facilities would involve an outlay of about Rs. 10 to 12 crores.

(vii) The implementation of the expansion schemes would increase the capacity for finished steel to 1,650,000 tons. Pig iron available for foundries would increase by 500,000 tons or alternatively there might be available an additional 200,000 tons of billets for re-rolling and 250,000 tons of pig iron for foundries. When compared with estimated requirements, this indicates a short-fall of about a million tons of steel. It is therefore necessary to take steps from now onwards for the establishment of a new iron and steel plant. In the present circumstances we consider that the best method of financing and operating a new steel plant would be through collaboration between the State and any Indian concern with knowledge of and experience in the industry and ability to raise equity capital. Participation by foreign concerns as well as the International Bank should also be invited and to this end the Central Government should arrange for early discussions in India and the U. S. A. It is estimated that the share of the Government during the period of the Plan on such a project would be of the order of Rs. 15·0 crores. The production programme of this plant would have to be linked with the final expansion programme of SCOB-IISCo in such matters as the provision of additional pig iron capacity, and the nature of the finished steel products to be manufactured. The total expenditure on the scheme during the period of the Plan might be placed at between Rs. 25·0 to 30·0 crores. Having regard to the importance of steel as a developmental commodity and to the fact that the project would take at least 6 years to materialise, the Government should arrange for negotiations with the different parties and come to early decisions on questions of location, etc., on the basis of expert advice.

(viii) Refractories constitute essential materials for the development of the iron and steel industry. The scheme envisaged by TISCo provides for the manufacture of refractories, so that the existing output of the refractories industry, to the extent released by TISCo, could meet the expanding requirements of SCOB-IISCo. This question of the availability of refractories should be examined in the context of the recommendation for the creation of additional iron and steel capacity and should be properly co-ordinated.

(ix) *Steel economy*.—Apart from increasing the production of steel in the country it is necessary to economise consumption of steel so as to reduce the gap between the quantity available and the full requirements. Economies in the consumption of steel for building and other purposes could be secured by the adoption of scientific designs for enabling light weight structural members to be used in place of heavy, hot-rolled sections. The Indian Standards Institution has prepared a scheme for undertaking the standardization of hot-rolled sections, fabricated sections, typical structural designs, codes of practice for the use of structural steels, etc., and this scheme should be implemented as soon as possible. Considerable economy could also be achieved by the adoption of welding in place of

rivetting. The strain on steel supplies could also be relieved by substituting timber for steel the life of which could be prolonged by appropriate prophylactic treatment and seasoning. Detailed suggestions on this subject are made in the chapter on Forests in the Final Report. When all the above recommendations are implemented it is estimated that a saving could be achieved in steel consumption for building and structural purposes to the extent of about 25 per cent. or nearly 150,000 tons per annum.

The following table summarises the programme of development of the iron and steel industry covered by the main producers:—

	Unit.	1950-51	1957-58 (After implementation of all projected schemes)
Rated capacity—			
Finished steel	Tons '000	1,015	1,650
Production—			
Pig Iron (for foundries)	"	350	750
Finished steel	"	976	1,650

Re-rolling Mills

I. Brief Survey of the Industry

The re-rolling mills manufacture a variety of products from the blooms and billets which they secure from the main producers in the country or from abroad by way of imports and which are supplemented to some extent by scrap.

To encourage the industry in the earlier stages the revenue duty on imported billets was removed and the fair selling price of indigenous billets was fixed with reference to the continental prices. As a result of this assistance and the general revival of demand for steel products, the industry made rapid progress and by 1939 there were 32 re-rolling mills with a productive capacity of 140,000 tons. This was exclusive of 4 mills which were manufacturing specialised products and were called "secondary" producers. During the war, in spite of the shortage of billets and scrap and in spite of the warning issued by Government in September 1941 that, in the event of their controlling steel and scrap, only those mills which were established before that date would be entitled to the supply of these materials, several new mills were started. Towards the end of 1942, when control over the distribution of scrap and billets was introduced, out of the 130 mills then existing, only 75 came within its purview. Later, the Central Government had to serve statutory orders on a number of mills directing their compulsory closure.

(a) *Location, rated capacity and production.*—There are at present 23 registered re-rollers of which five are manufacturers of special products such as tin plates, wire and wire products, fish plates and spikes, bars and rods, bolts and nuts, rivets, spring steel, hoops and strips and are called "secondary producers". In addition there are 71 re-rollers who are not registered. The productive capacities of the different sections of re-rollers on the basis of working three shifts are given below:—

	Tons per annum
Secondary producers	220,000
Registered re-rollers	292,000
Unregistered re-rollers	219,000
Total	733,000

The secondary producers manufactured 147,276 tons of finished steel products in 1949, whereas the production of registered and unregistered re-rollers was 86,000 tons in 1949 and 96,000 tons in 1950.

II. Problems of the Industry

(a) *Shortage of raw materials.*—The main problem of the re-rolling industry is the shortage of raw materials—billets and scrap. The " secondary " producers whose products are not competitive with those of the main producers are somewhat better placed in this respect than the other re-rollers who compete with the main producers. This shortage of billets is due to the fact that the finishing capacity of the Indian steel industry is far in excess of the steel making capacity. As a result, the supply of billets to the re-rolling industry can be increased, for years to come, only through imports. For economic working, it is considered that a re-rolling mill should be able to operate at least on a two-shift basis. For want of raw materials most of the mills are, however, working only one shift and a number of them work even less. If the secondary producers and registered re-rollers are to operate for two shifts it is estimated that imports of ingots, billets, blooms, etc., to the extent of 130,000 to 160,000 tons per annum will be required during the period of the Plan. This estimate is based on the availability of indigenous supply of semis of the order of 200,000 to 250,000 tons per annum. Every effort should be made to secure by way of imports the quantity of semis indicated above until indigenous supplies can be harnessed through expansion of the steel industry.

(b) *Technical efficiency of the mills.*—In 1933-34, the Tariff Board stated that the re-rolling mills had a place in the iron and steel industry of India. It also indicated the scope for their development. Since the main producers are in a position to manufacture standardised finished products at a much cheaper cost than the re-rolling mills, the latter have no scope for manufacturing these products except for supplying the needs of markets which are at a considerable distance from the main producers. Their main field is limited to special sections not rolled by the main producers and to production against urgent small orders. Actually, however, excepting the " secondary " producers who manufacture special products which are not competitive with those of the main producers, the bulk of the re-rolling industry is organised to turn out the same categories of finished steel as are manufactured by the main producers. The various Tariff Boards and the Iron and Steel (Major) Panel have investigated the position of the re-rolling industry at different times and it has been found that a large proportion of the mills are inefficient and uneconomic.

III. Programme of Development

Recommendation.—In view of the fact that the re-rolling industry—particularly the registered and unregistered re-rollers—has expanded in an indiscriminate manner and far in excess of the demand for several products which it can economically produce and is organised rather unsatisfactorily in respect of location, pattern of production and technical equipment, its future programme should aim at re-organisation on the lines indicated in the report of the Iron and Steel (Major) Panel (1946).

2. ALUMINIUM

Aluminium is almost the only non-ferrous metal which India can produce in large quantities. In addition to extensive deposits of bauxite, the raw material for aluminium, which occur in many parts of the country, adequate supplies of bulk power, which is the other important element in the manufacture of aluminium, can be obtained at reasonable rates from the new projects for the production of electric power.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There are two aluminium manufacturing units in the country, the Indian Aluminium Company Ltd. (working in collaboration with the Canadian Aluminium Company) and the Aluminium Corporation of India Ltd., which is owned and operated by an Indian firm. The Indian Aluminium Company started production with imported alumina by utilising hydro-electric power available at Alwaye in Travancore-Cochin. Subsequently, the company expanded its operations and put up an alumina plant at Muri in Bihar. The alumina produced in this plant is converted into pig aluminium at Alwaye and rolled into sheets and finished goods at Calcutta. The Aluminium Corporation has an integrated plant which takes in bauxite and ends up with rolled metal and other finished products. It is located at Jaykaynagar near Asansol, in close vicinity to coal mines which enables it to generate cheap thermal power. The two plants together have a total capacity of 4,000 tons of aluminium ingot per annum. The rolling mills of the two concerns have an annual rated capacity of 3,500 tons. The capacity of the alumina plants, however, is 14,000 to 15,000 tons, which offers scope for stepping up the production of aluminium. The total production of aluminium of the two units was 3,362 tons in 1948, 3,490 tons in 1949, 3,596 tons in 1950, and 3,849 tons in 1951.

(b) *Capital and Labour.*—The amount of capital invested in the industry is about Rs. 350 lakhs, in the form of paid-up and debenture capital. The industry provides employment for nearly 3,000 workers.

(c) *Raw materials.*—The important raw materials with their approximate quantities per ton of aluminium are as under:—

Bauxite	4.5 tons.
Caustic soda	0.16 to 0.2 tons.
Cryolite	0.07 to 0.10 „
Aluminium Fluoride	0.035 to 0.04 „
Fluorspar	0.007 to 0.008 „
Petroleum coke	0.75 tons
Pitch	0.2 „
Coal	4.0 „
Furnace oil	0.5 „
Electric energy	20,000 to 24,000 KWH.

Except bauxite and coal, most of the other raw materials are available only partly or not at all from indigenous sources. Caustic soda and soda ash, for instance, although produced in the country, are not produced in sufficient quantities to meet the total industrial demand. Fluorspar occurs to some extent in Madhya Pradesh, but more information than is available at present about its quality and quantity is necessary in order to assess its usefulness for the aluminium industry. Cryolite, aluminium fluoride, carbon blocks and filter cloth, have to be imported. Greenland is the main source of natural cryolite but artificial cryolite is produced in other countries and with the development of the aluminium industry the possibilities of producing it in this country will have to be investigated.

(d) *Imports and exports.*—Aluminium is imported into the country in the form of either ingots or sheets and circles. Imports of ingots in 1948 and 1949 were small, *viz.*, only 830 and 15 tons respectively: but imports went up to over 1,836 tons in 1950 and 3,190 tons in 1951. Imports of sheets and circles have decreased from 6,023 tons and 7,873 tons in 1948 and 1949 to 3,690 in 1950 and 3,348 in 1951.

Although small quantities of aluminium goods are exported to the Far East, particularly in the form of aluminium ware, there is no export of aluminium in the form of ingots and sheets. In view of the inability of the indigenous aluminium industry to compete with Canada, the U. S. A. and the U. K. in the export markets on account of its high costs of production, the scope for developing a large export market in the near future would appear to be small.

(e) *Estimated consumption and requirements.*—The demand for aluminium in different forms has been estimated at between 15,000 to 20,000 tons per annum. The latest estimates, however, place the demand at about 16,000 tons a year: 10,000 tons for utensils, 2,500 tons for A. C. S. R. cables, 2,000 tons for industrial sheets and the balance for defence requirements and miscellaneous purposes. In other countries the demand for aluminium has increased considerably during the last ten years, one of the factors responsible for such a large increase being its low price. The Panel for the Aluminium Industry (1947) had fixed a short-term target of production of 15,000 tons a year to be secured in five years, while the long-term target to be secured at the end of 15 years was placed at 50,000 tons per annum. The present demand of 16,000 tons approximates to the short-term target determined by the Panel. It should, no doubt, be possible to increase the demand for aluminium by reducing its price but this is not feasible in the near future. Even in the long run, the prospects of India being able to produce this metal at prices comparable to those at which it is being produced in the U. S. A. and Canada appear to be remote. With the programme of expansion envisaged by the manufacturers of A. C. S. R. cables, their requirements of aluminium would increase by two or three thousand tons by 1955-56. The amount of aluminium required for utensils may not show any appreciable increase as the price of aluminium is not expected to go down considerably during the period under consideration.

II. Problems of the Industry

Several problems confront the aluminium industry in this country. In the first place, the dispersed structure of the Indian Aluminium Company, involving transport of alumina and aluminium ingots over long distances, adds to its cost of production. Moreover, the size of both the existing plants is not economic. For securing the maximum economies of production, an aluminium plant should have a capacity of 15,000 to 20,000 tons per annum but the capacity of each of the two plants is only 2,500 and 1,500 tons per annum. Small plants of this size can, however, reduce their costs to a certain extent if they can obtain their alumina from a single large unit instead of each producing it on a small scale. Thirdly, the inherent refractory nature of Indian bauxite, which costs more to mine and requires more grinding and higher concentration and temperature of the digesting liquor, enhances the cost of purification and augments the consumption of bauxite per ton of aluminium. Other raw materials like petroleum coke are also expensive. Finally, electric energy which is consumed in large quantities both for producing alumina and pig aluminium and the cheapness of which constitutes the principal advantage of the Canadian industry is costly in India. For the present, these factors militate against the possibility of the

industry being established on an economic basis. However, as aluminium is the only non-ferrous metal of which India possesses adequate deposits, it is essential to develop it in spite of its higher production cost. The development will have to be brought about by the expansion of the capacity of existing manufacturers, for, in view of the large amount of capital already invested in them, such expansion is necessary to enable them to pay their way.

III. Programme of Development

(a) *Existing programme.*—Both the manufacturing units—the Indian Aluminium Company and the Aluminium Corporation of India—are fully aware of the need for increasing the capacity of their reduction plants to 5,000 tons per annum. The Indian Aluminium Company envisages the expansion of the smelter at Alwaye to 5,000 tons to be completed by the end of 1953, and proposes to utilise additional power expected to become available in the Travancore-Cochin area. It has also planned to increase the rolling capacity of its mills at Belur to 6,000 tons per annum. This scheme is also expected to materialise by 1953.

The Aluminium Corporation of India has a scheme to step up the production of aluminium ingots to 2,000 tons per annum and to increase the sheet rolling capacity from 500 tons to 3,000 tons and has obtained a loan of Rs. 50 lakhs from the Industrial Finance Corporation. The expansion is expected to be achieved by the end of 1953.

The Indian Aluminium Company has recently completed a survey of the possibilities of development of the aluminium industry in the Hirakud area. On the basis of the recommendations made in the report of the Company's Technical Mission, it has formulated a phased programme of development on the following lines:—

(i) establishment by early 1956 of a smelter with an annual capacity of 10,000 tons per annum;

(ii) expansion of mining of bauxite at Lohardoga to 80,000 tons and of alumina production at Muri to 30,000 tons per annum by the end of 1958.

During the period between the completion of the smelter at Hirakud and the expansion of Muri Works (*viz.*, 1956-58), the requirements of alumina would have to be met by imports.

(b) *Recommendations.*—The following recommendations are made for the development of the industry:—

(i) The capacity of the plant of the Aluminium Corporation of India should be increased so as to produce 5,000 tons of ingots per annum.

(ii) Facilities should be afforded for the implementation of the expansion plan of the Indian Aluminium Company mentioned above or for any alternative project designed to bring into existence additional capacity for production of 10,000 to 15,000 tons of aluminium per annum.

(iii) The petroleum refineries should include in their manufacturing programme the production of calcined petroleum coke required by the aluminium industry.

(iv) Arrangements should be made to ensure regular and adequate supplies of cryolite which has to be imported.

The following table summarises the development programme of the industry:—

—	Unit	1950-51	1955-56
Number of smelters	..	2	3
Installed capacity	Tons	4,000	20,000
Production	„	3,677	12,000*

*Actual production in 1955-56 is low compared to capacity because the new smelter at Hirakud is expected to come into operation only by the end of 1955.

B. Mechanical Engineering Industries

3. AGRICULTURAL IMPLEMENTS AND MACHINERY

The Agricultural Machinery* Industry in India is of considerable importance, as agriculture holds the foremost place in the national economy. The problem of increasing agricultural production calls for the introduction of improved methods of cultivation and the application of modern techniques.

Although it is difficult to measure precisely the increased yield due to the adoption of any particular agricultural machinery, it is certainly possible to increase yields appreciably through improved or power-driven implements and machinery. The use of agricultural machinery can also help in the reclamation of areas which have gone out of cultivation due to *kans* and *hariali* infestation, in bringing new lands under cultivation, reducing drudgery in agricultural operations and saving time and labour, etc.

At present three distinct categories of agricultural machinery are used in the country:—

(i) Indigenous Agricultural Implements;

(ii) Improved Agricultural Implements; and

(iii) Power-driven Agricultural Machinery including—

(*a*) Power-driven Pumps (Centrifugal);

(*b*) Diesel Engines; and

(*c*) Agricultural Tractors.

(i) Indigenous Agricultural Implements.

The manufacture of indigenous agricultural implements is conducted on a cottage industry scale and it is considered that this section of the industry, after some rationalisation with respect to the design of implements, is well suited for cottage and small-scale production. This section of the industry is, therefore, not dealt with in this Development Plan.

(ii) Improved Agricultural Implements.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There are several factories, big and small, engaged in the manufacture of improved agricultural implements which can be broadly classified into five categories as under:—

(i) field implements such as ploughs, cultivators, seeding, planting and threshing machinery, etc.;

(ii) agricultural hand tools such as spades, shovels, hoes, pruning and cutting knives;

*The term "Agricultural Machinery" is taken to include all such tools, implements and power-driven plants and machinery as are generally or commonly used for agriculture and also those which, although used for non-agricultural operations, are used more for agricultural purposes than otherwise, for instance, diesel engines below 10 H.P., pumps, bullock-cart axles and tyres, etc.

(iii) irrigation equipment such as Persian wheels, manually operated water pumps, etc. ;

(iv) plant protection equipment like sprayers and dusters ; and

(v) machinery for processing agricultural products, *e.g.*, oil ghanis, cane crushers, chaff cutters, groundnut decorticators, oil presses, tobacco barns, etc.

At present there are 68 factories with a rated capacity of 26,000 tons of steel per annum on the Central list with whose activities the Development Wing of the Ministry of Commerce and Industry is in touch ; but there are in addition a number of other factories engaged in the manufacture of improved agricultural implements in the different States about which no information is available. It is not, therefore, possible to arrive at an estimate of the production of improved agricultural implements in the country.

(b) *Imports.*—Statistics relating to the quantity of different types of agricultural implements imported into the country and their value are not available for recent years as these are not separately classified in the Accounts relating to the Sea-borne Trade of India. It is also not known whether the implements imported are hand-operated or animal-drawn or power-driven. Imports of improved types of implements are allowed on a restricted basis, but imports of chaff cutters and cane crushers (other than power-driven types) are totally prohibited at the present time. Statistics relating to the value of imports of agricultural implements of different categories in 1949-50 are shown below:—

Imports of Agricultural Implements into India

(Value in Rs. '000)

	1949-50
1. Agricultural implements	57,26
2. Ploughs and parts	94,61
3. *Other sorts*—	
(i) Corn crushing machines	38
(ii) Graders	28
(iii) Threshing machines	2,76
(iv) Ridgers	..
(v) Seed drills	2,94
(vi) Cultivators and harrows	6,71
(vii) Chaff cutters	3,31
(viii) Hay presses	12
(ix) Disinfectors	5,99
(x) Others	17,30
TOTAL of (3)	39,79
GRAND TOTAL	191,66

Imports in the following years were:

(Value in Rs. '000)

	1950-51	1951-52
Agricultural implements	24,56	196
Ploughs and parts	1,11,61	1,21,33
Other sorts	68,38	1,51,52
TOTAL	2,04,55	2,74,81

(c) *Estimated consumption and requirements.*—In the absence of statistical data regarding imports and production, it is difficult to assess the requirements. It can be

broadly stated that the demand for imported implements will expand, but the extent of the expansion would depend on a number of incalculable factors such as the trend of agricultural price levels, the progress made by extension services in the States for popularising improved types of implements, the evolution of improved designs, etc.

II. Programme of Development

(a) *Existing programme.*—The expansion programmes of the existing manufacturers of improved types of agricultural implements, if any, are not known.

(b) *Recommendations.*—(i) Statistical information relating to the production capacity, actual production, types of product, capital investment, labour employed, etc., in this section of the industry is not available for all the organised factories. Efforts should be made to collect these statistics regularly and maintain them up to date.

(ii) The development of this section of the industry should mainly aim at providing a steady market for its products. This would require the creation of an extension service in every part of the country or, in other words, a series of regional research stations, linked to a central one, where new models acceptable to cultivators could be evolved and tried out. This would also require effective forward planning by the State Governments by which demands of the various items could be anticipated in advance and factories enabled to work on a more or less constant load. Such a production programme would also require extension of credit facilities which in this case, if the annual capacity to consume steel is to be raised to 100,000 tons per annum, may be estimated at between Rs. 6 to 8 crores.

(iii) POWER-DRIVEN AGRICULTURAL MACHINERY

Broadly speaking, it is still true to say that the bulk of the demand for power-driven agricultural implements and machinery is met by imports, except to some extent in the case of pumps and diesel engines. Statistics relating to the imports of power-driven agricultural implements, including ploughs and their parts are shown in the table on page 26. The existing supply and demand, future development and problems of the three sub-categories of power-driven agricultural machinery, namely (A) pumps, (B) diesel engines, and (C) agricultural tractors, are discussed below separately.

A. POWER-DRIVEN PUMPS (CENTRIFUGAL)

Power-driven pumps are used extensively for both industrial as well as agricultural purposes, *viz.*, for feeding boilers, pumping sewage, etc., and for watering fields in the rural areas. The most popular type of pump is the centrifugal pump (horizontal spindle type), because of its low cost, light weight, simplicity, durability and efficiency. The vertical type of centrifugal pump has only recently been introduced into India and is not required in large numbers at present.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—At present, there are 20 organised factories, all in the private sector, manufacturing power-driven centrifugal pumps and their total rated capacity, assessed on an 8-hour single shift basis, is estimated at about 42,800 pumps per annum. This capacity has increased from 33,460 in 1950 and 34,600 in 1951. The largest manufacturers are Messrs. Kirloskar Bros. Ltd., with an annual rated capacity of 12,000 pumps. Among other important manufacturers are: Messrs. Forge and Blower Co. Ltd., Messrs. Modern Engineering and Moulding Co. and Messrs. Jyoti Ltd. The

last-named firm also produces centrifugal pumps with vertical spindle. The Statewise distribution of these factories is as follows:—

Bombay	9
Madras	5
West Bengal	4
Delhi	1
Madhya Pradesh	1

The actual production of pumps has increased considerably during the last three years it was only 14,333 pumps in 1949 as against 33,292 in 1950 and 47,989 in 1951.

(b) *Capital and labour.*—Figures relating to the capital invested exclusively in this industry are not available, as all the units are also manufacturing various other machinery. The total number of persons employed in the pump industry (registered units only) is estimated at present at about 4,500.

(c) *Raw materials.*—The principal raw materials required for the manufacture of pumps can be classified broadly under two categories, namely (i) ferrous materials, including pig iron for base plate and pump body (some manufacturers use it for impellers also), and mild steel for shafts and keys; and (ii) non-ferrous materials, mainly gun metal for impellers and bushings. The quantities of the principal raw material required per pumps are approximately 2 cwts. of pig iron, 15 lbs. of mild steel and 6 lbs. of gun metal. All these raw materials are available from indigenous sources. In addition, certain components, including ball bearings (2 per pump), bolts with nuts, strainers, packing glands, etc., are also required for the manufacture of pumps. Some of these components like strainers, packing glands, etc., are imported from abroad.

(d) *Imports and exports.*—The quantity of pumps imported into the country is not known. The import policy announced for January-June, 1952 allows the import of centrifugal pumps with horizontal spindle, having delivery outlet of 6″ diameter and less, on a restricted basis while centrifugal pumps with horizontal spindle, having a delivery outlet of about 6″ diameter are allowed to be imported freely. Total imports of centrifugal pumps, including turbine pumps, which were valued at about Rs. 83 lakhs in 1948-49 had gone down to Rs. 61 lakhs during 1949-50 and Rs. 57 lakhs during 1950-51. In 1951-52 imports rose to Rs. 90 lakhs. There are no appreciable exports of pumps from India.

(e) *Estimated consumption and requirements.*—In the absence of statistics relating to the quantity of pumps imported it is difficult to estimate the total quantity available for consumption. However, assuming the average import price for a pump to be about Rs. 1,500, the total quantity available for consumption during 1950-51 may be roughly estimated at about 38,000 pumps as against an estimated demand for about 60,000 pumps, under the existing conditions. As regards the future, it is again difficult to forecast the volume of the future demand for pumps with any accuracy. However, the demand may be tentatively estimated to increase to about 100,000 pumps including tube-well pumps, by the end of 1955-56.

II. Problems of the Industry

The main problems of the industry at present relate to the short supply of the raw materials, particularly pig iron, and the conditions under which the allocations of the raw materials are made to the industry. Apart from inadequate supplies of pig iron, quotas to the industry are allocated on a quarterly basis which hinders the industry in carrying out long-range planning. Further, certain State Governments are reported to be withholding

the supply of controlled raw materials unless the manufacturers are prepared to produce the finished products within the boundaries of their own States.

At present, the manufacture of pumps is located largely in the Bombay area since it is possible to undertake the manufacture as auxiliary to existing works and thereby reduce capital requirements. However, there is a danger that the industry might become excessively concentrated in a single area. Efforts should, therefore, be made to facilitate the establishment of new units in the north and other specified localities, which would also help to stimulate the demand for pumps in those areas, provided that conditions become favourable in regard to the supply of pig iron.

III. Programme of Development

(a) *Existing programme.*—The capacity at the present time, as already explained, is 42,800 pumps per annum. As regards the development plans for the pump industry, Messrs. Kirloskar Bros. whose existing rated capacity is 12,000 pumps per annum, have formulated a plan to expand their capacity to about 25,000 pumps per annum during 1951-52 by working for more than one shift and, subsequently, to as much as 50,000 pumps per annum by the end of 1952-53. Since the programme is based on a multiple shift operation, it is difficult to assess what the rated capacity of the company on a single shift basis would be when the expansion takes place. For the present it is assumed at 25,000 pumps per annum. Secondly, Messrs. Cooper Engineering Co. also propose to undertake the manufacture of centrifugal pumps and expect to produce about 4,800 pumps per annum before the end of 1951. Thirdly, another new firm, Messrs. Mahindra & Mahindra Ltd., have plans to manufacture about 1,600 pumps per annum during 1952, in technical collaboration with Messrs. Harland Engineering Co. of Scotland. With the implementation of these three plans, the total rated capacity of the industry is expected to increase to about 62,200 pumps per annum by 1952-53.

In addition to the plans mentioned above which are under implementation, if the scheme of Dandapani, Coimbatore, to manufacture about 500 to 600 pumps per month is also implemented during 1953-56, the total rated capacity of the industry would increase to about 69,400 pumps per annum by the end of 1955-56.

(b) *Recommendations: Programme of production.*—During 1952-53, the production of pumps on the basis of the present rate of monthly production is estimated at 50,000 units. The production is envisaged to increase further in subsequent years and ultimately come to 80,000 to 85,000 units in 1955-56. On the basis of the present estimates of demands in 1955-56 which is placed at 100,000 pumps, an appreciable gap between requirements and domestic production would be in evidence. A large fraction of this gap would be covered as a result of the expansion plans of the deep-well turbine pumps industry discussed below.

The deep well turbine pumps which are particularly suited for pumping water from deep wells since the lifting capacity of these pumps is not limited to a depth of 22 ft., have a great advantage over the horizontal type of centrifugal pumps. Construction of a large number of tubewells has been planned during the next few years, both under the States' Irrigation Projects as well as under the Indo-American Technical Co-operation Development Programme. The total demand for such pumps might be estimated at over 10,000 pumps during the next five years. As against this demand, the rated capacity of the existing unit,

namely, Messrs. Jyoti Ltd. is only 600 pumps per annum. Two new firms Messrs. Kirloskar Bros. and Messrs. Johnston Pumps (India) Ltd. propose to manufacture deep well turbine pumps in the near future. The latter, an associate of Messrs. Johnston International Pump Co. of California, U. S. A., combines both Indian and American capital know-how and personnel and they propose to undertake negotiations with the Government to drill and equip 2,000 to 2,500 tubewells. It is expected that the firm will start progressive manufacture of pumps during 1952.

In view of the inadequate capacity of the indigenous deep well turbine pump industry to meet the future requirements, the manufacture of such pumps on a larger scale should be encouraged within the country preferably by multiple shift operations. For some time to come, however, imports of deep well turbine pumps will be necessary. But the imports of such pumps should be without hollow spindle vertical electric motors as soon as the manufacture of these motors is established in the country in sufficient quantities.

B. Diesel Engines

Diesel engines are becoming increasingly popular with the agriculturists for driving pumps, chaff cutters, threshing machines, etc., because of their simplicity and relatively rugged construction. Besides, they have also gained considerable importance in the industrial field by supplying motive power in areas where electric power is not easily available. Diesel engines also use cheaper fuels, giving the highest thermal efficiency achieved hitherto with any type of heat engine.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There are 5 organised units, all in the private sector, which are at present engaged in the manufacture of diesel engines. The total annual rated capacity of these five units, assessed on the basis of 8-hour single shift and 300 working days, is estimated at the present time at about 11,325 diesel engines as against 4,770 during 1949-50 and 6,320 during 1950-51. At present except for one small unit located in Delhi-Shahdara, the other 4 units are all located in the Bombay area. The existing capacity of 11,325 diesel engines has been arrived at on the assumption of the ability of some firms, namely, Messrs. Kirloskar Oil Engines Ltd., Kirkee and Messrs. Cooper Engineering Ltd., Satara to get a number of components of diesel engines manufactured in their sister concerns. This ability raises their rated capacity considerably provided there is an incentive for production by way of reduced imports.

The actual production of diesel engines was, until recently, considerably below the rated capacity. The actual production was of the order of about 1,290 diesel engines (value at about Rs. 19 lakhs, on the basis of Rs. 1,500 per engine) during 1948-49, 2,440 (Rs. 37 lakhs) during 1949-50 and 5,540 (Rs. 83 lakhs) during 1950-51. Production in 1951-52 is estimated at about 7,300 diesel engines. At present, nearly 75 per cent. of the industry's total output is of diesel engines up to 10 H. P. and the rest between 11-20 H. P.

(b) *Capital and labour.*—The total capital invested in the industry is estimated at approximately Rs. 1,43 lakhs. The total number of workers employed in the industry is roughly estimated at about 6,000.

(c) *Raw materials.*—The main raw materials required for the manufacture of diesel engines are: (i) pig iron for cylinder blocks, main frame, etc.; (ii) mild steel and Martin's acid steel for crankshafts and connecting rods; (iii) medium carbon steel (carbon ranging from 0·45 to 0·60 per cent.) for small wear resisting components, (iv) alloy steel (nickel, nickel chromer or molybdenum of heat-resisting specification) for valves and fuel injection gear; and (v) bronze-lead, phospher bronzes and white metal for heavy duty bearings. All the ferrous metals such as cast iron, mild steel, etc., are available from indigenous suppliers who import certain virgin metals from abroad. The existing factories have, however, to import certain components such as crankshafts, fuel injection equipment, cam shafts, connecting rods, cylinder liners, pistons and springs, studs, etc. It has been the policy of the Government to encourage the manufacture of these components and it is expected that components such as pistons, piston rings and cylinder liners will be available from indigenous manufacturers shortly. The quantities of the principal raw materials required during 1950-51 for an actual production of about 5,540 diesel engines, were estimated at about 3,290 tons of pig iron, 366 tons of steel and 131 tons of bronzes. The quantity of each of the components required is roughly equal to the number of diesel engines actually produced.

(d) *Imports and exports.*—India imported 37,174 diesel engines (valued at Rs. 8,64 lakhs) during 1949-50, 35,571 (Rs. 6,83 lakhs) during 1950-51, and 72,365 (Rs. 1,473 lakhs) during 1951-52. Information relating to the types of imported engines and their respective horse-power is not available. However, on the basis of certain import statistics for the period July 1949 to June 1950, it is estimated that about 50 per cent. of the total engines imported in the country were below 10 H. P., about 30 per cent. between 11—20 H. P., and about 10 per cent. each between 20—25 H. P. and above 25 H. P. It is necessary to point out that the engines below 10 H. P. are playing a prominent role in the Grow More Food Campaign.

(e) *Estimated consumption and requirements.*—The total quantity of diesel engines available during 1949-50 was 39,614 and it increased to about 41,110 during 1950-51 and to 79,665 engines during 1951-52 owing to heavy imports. While it is difficult to estimate the actual demand for the engines in the country, it is probable that, because of heavy imports, more engines are at present available in the country than are required. This has affected adversely the off-take of the indigenously manufactured engines and thus the growth of the diesel engine industry.

It is difficult to anticipate, with any accuracy the future demand for diesel engines either for agricultural or industrial purposes. However, with the completion of some of the multi-purpose and other power projects and the increased availability of hydro-electric power for all purposes, the demand for diesel engines will become limited mainly to those areas which will not be enjoying such hydro-electric power facilities. It may, therefore, be assumed that the demand for diesel engines, including replacement requirements, would increase at a somewhat slow pace to about 40,000 engines below 10 H. P. and to about 20,000 engines above 10 H. P. per annum, by 1955-56.

II. Problems of the Industry

The problems of this industry are identical with those of the pump manufacturing industry, which have been discussed earlier.

III. Programme of Development

(a) *Existing programme.*—The Central Government have sanctioned the establishment of seven new units for the manufacture of diesel engines which are expected to go into production during 1952-53. The new units are as under:—

Name of the Company	Location	Annual rated Capacity
		Numbers
1. Messrs. Khusbalani Russel Newberry & Co. Ltd. .	Bombay	5,800
2. " James Beechey & Co. Ltd.	Do.	1,200
3. " Shree Ram Mills Ltd.	Do.	600
4. " Indian Commercial Co. Ltd.	Do.	3,600
5. " Hindustan Electric Co. (subsidiary of Hindustan Motors Ltd.)	Calcutta	3,000
6. Messrs. Nandalal Bhandari & Sons	Indore	2,400
7. Faridabad Development Board	Faridabad	1,800

With the implementation of these new projects the annual rated capacity of the industry would increase to 29,725 diesel engines on the basis of single shift operation for 300 days.

(b) *Recommendations.*—Production of diesel engines is also being envisaged by certain other manufacturers apart from expansions under contemplation by Messrs. Kirloskar Oil Engines Ltd. and Messrs. Cooper Engineering Ltd. on the basis of a long-term stable import policy being adopted by the Central Government. For instance Messrs. Karam Chand Thapar have submitted to the Central Government a scheme for the manufacture of diesel engines and Messrs. Mahindra and Mahindra Ltd., have been carrying out negotiations for the manufacture of diesel engines in technical collaboration with an English firm. All these schemes have yet to be scrutinised by the Licensing Committee if the parties approach the Central Government for necessary permission.* When the capacity by 1952-53, *viz.*, 29,725 diesel engines per annum on a single shift basis, is compared with estimated requirements, *viz.*, 60,000 diesel engines by 1955-56, it is felt that it might be desirable to permit additional capacity of the order of 10,000 diesel engines being brought into existence so that requirements may be met almost entirely from domestic production. This additional capacity would also ensure maintenance of the quality of engines by encouraging competition to a certain extent. Before licensing new units or substantial expansion of existing manufacturers the Central Government should make a re-assessment of the requirement under different categories of H. P., and give preference to entrepreneurs who would undertake to manufacture the largest percentage of components within the country or to co-ordinate their activities with other industrial units on the basis of definite manufacturing programmes. Assuming that additional capacity of 10,000 diesel engines would be established, the annual installed capacity by 1955-56 would increase to about 39,725 on a single shift basis. As regards actual production, it is suggested that the industry should aim at achieving a production of 50,000 diesel engines of different H. P. by 1955-56 by working on a multiple shift basis. Therefore, restricted imports, mostly of diesel engines of over 11 H. P. would be necessary to cover the gap between the indigenous output and the anticipated demand, during the next few years. The quantum of the imports should be reviewed and adjusted every year to prevent adverse effects of heavy imports on domestic production.

*Permission has recently been given to Messrs. Mahindra and Mahindra Ltd. to establish a factory near Calcutta.

C. Agricultural Tractors

There are, at present, large areas of culturable land lying uncultivated in the country since they suffer from certain handicaps such as extensive wild growth, wild animals, malaria, etc. Human and animal labour are also extremely scarce in these areas and the only method by which they can be brought under cultivation expeditiously is by the use of tractors and other mechanised equipment. Moreover, large areas estimated at about 10 million acres, have gone out of cultivation because of *kans* and *hariali* infestations. These tracts of land lying mostly in South U. P., Madhya Bharat, Bhopal, Madhya Pradesh and Vindhya Pradesh, can be reclaimed by ploughing to a depth of twelve inches or so, and this can be done economically only through tractors and allied machinery. In view of the importance of tractor cultivation in the country, the Panel on Automobiles and Tractors (1947) recommended that the tractor manufacturing industry should be established with the direct and active participation of the Central Government. Subsequently, however, according to the Statement on Industrial Policy announced by Government in April 1948, the setting up of the tractor manufacturing industry has been left to private enterprise, although its planning and regulation will be under the control of the Central Government.

I. Brief Survey of the Present Position

It is estimated that there were about 10,000 tractors in actual use during 1949-50. At present, there is no regular tractor manufacturing plant and the country has to depend entirely on the import of tractors, either in c. k. d. condition or otherwise. The following table shows the value of tractors imported during the last three years.

Imports of Tractors

Year	Numbers	Value (Rs. crores)
1949-50	3,318	4·37
1950-51	4,930	4·08
1951-52	7,148	5·98

Till recently, statistics relating to the number of tractors imported into the country were not recorded. However, since April 1949, separate accounts of the number of imported tractors are being maintained. To ensure an adequate supply of suitable types of agricultural machinery, particularly tractors, and also a rationalised distribution within the country, import licences for tractors and allied implements are issued in consultation with the Ministry of Food and Agriculture. According to certain conditions laid down for the import of tractors, spare parts to the extent of 15 per cent. of the value of tractor imports have to be imported along with tractors. The tractor implements are at present under 'open general licence' and there is no minimum prescribed limit for their imports. At the same time, in order to ensure proper servicing of tractors, facilities have been granted to the tractor importers for the import of service tools and tractor attachments to the extent of 5 per cent. and 15 per cent., respectively, of the value of the tractor imports.

Soon after the end of the last war, some of the old tractors were acquired from American Disposals' stock. A few were sold after rehabilitation and repair to the State Governments while the balance were utilised for *kans* reclamation work in Central India starting from 1947. The scheme made good progress and the Government of India were encouraged to prepare a scheme for the reclamation of 3 million acres of *kans*-infested land over a period of seven years with the help of 375 new machines to be obtained with the help of a loan from the International Bank. The scope of the plan was, however,

curtailed subsequently, and at present the target is only 2 million acres to be achieved with 240 new machines. Of the new machines, 210 tractors engaged on *kans* reclamation, reclaimed 226,000 acres of land in 1950-51 and 235,000 acres of land in 1951-52. The rest of the machines, 30 in number, are being utilised on a pilot project of jungle clearing in the Naini Tal Tarai of Uttar Pradesh. These machines have already completed and made ready for the plough 20,000 acres of jungle land in the Tarai during the years 1950-52. Another 20,000 acres are expected to be tackled during 1952-53. The old machines are no longer being used on an extended scale for reclamation work, though a few of them are being used as stand-by machines.

While there is no tractor manufacturing plant in the country, Messrs. Harry Ferguson of India are assembling tractors at the rate of 300 per month at Madras. They propose to expand their assembling capacity to about 600 per month by the end of January 1952. Besides, Messrs. Kirloskars and another firm in the Punjab have also recently started production of tractor implements, though not on an extensive scale. It is, however, necessary to point out that a factory manufacturing improved types of agricultural implements can be regarded as a potential producer of tractor implements with a little additional plant.

Estimated requirements and consumption.—Although between 4,000 and 5,000 imported tractors were available during 1950, the present demand has been estimated at about 10,000 tractors per annum. With an increase in the pace of reclamation of weed-infested areas and cultivation of new lands now lying waste, the demand for tractors is expected to increase appreciably during the next few years. Tractor cultivation will also help in bringing down the general price level of agricultural products. Accordingly, it is estimated that the demand for tractors will increase to between 12,000 and 15,000 per annum by the end of the next five years.

II. Programme of Development

(a) *Existing programme.*—At present, though there is no scheme under implementation for the setting up of a tractor manufacturing plant in the country, a few firms are contemplating the manufacture of tractors in progressive stages, in collaboration with some of the foreign firms. In addition, the State Government of Orissa are also contemplating the establishment of a factory in association with private enterprise for the manufacture of agricultural tractors. The scheme, estimated to involve a capital cost of about Rs. 2 crores, including working capital of about Rs. 15 lakhs for the manufacture of spare parts, is designed to provide a production capacity of 15,000 tractors per annum. It has been proposed to manufacture tractors of 30 H. P. driven by petrol or kerosene and the cost of production of a tractor is estimated not to exceed half the price of an imported tractor, which ranges between Rs. 7,500 and Rs. 9,000 each.

(b) *Recommendations.*—(i) While the necessity of encouraging indigenous manufacture of tractors cannot be denied, certain important questions such as the scope for tractor cultivation in the country, the types of tractor required, the demand in respect of each type, etc., have to be examined. While it is recognised that there should be three different sizes or types of tractor to suit the varying conditions of soil and size of holdings, it is difficult to assess the number of each type or size of tractor required in the absence of reliable statistics of the number and size of different agricultural holdings. At the same time, tractor manufacture, divorced from automobile manufacture, may not be able to sustain itself in the country for some years to come. This is because the total requirement

of 10,000 to 15,000 tractors is made up of a variety of models and sizes, none of which is required in sufficiently large numbers to sustain a modern tractor manufacturing plant. The development of tractor manufacture will, therefore, have to be closely coordinated with the development of automobile manufacture in the country and should be considered only after a close examination of the various questions relating to tractor cultivation mentioned above.

(ii) For the development of the tractor industry on sound lines, it is essential that tractors suitable for different conditions obtaining in different parts of the country should be standardized. Such standardization should as far as possible be confined to the fewest makes and horse power. This will encourage the growth of ancillary industries for tractor parts and will ultimately lead to the manufacture of complete tractors in the country.

General Recommendations

The following general recommendations affect the entire agricultural machinery industry. Some of these have already been made in the Section on Agricultural Implements and Machinery in Chapter XVIII of the Report, but they are repeated here for the sake of completeness.

1. Regional Committees consisting of technical experts, enlightened farmers, manufacturers of agricultural implements and representatives of the State Governments should be set up, which would indicate the lines on which research and development work on agricultural implements should proceed and on the priorities as between different types of implements and machinery.

2. To make the different products of the agricultural machinery available to the cultivators, organisation of rural agencies will be necessary. On the one hand, these agencies will have to provide credit facilities including acceptance of payment in *kind* and, on the other, be organised on a cooperative basis in order that implements, such as threshers which cannot and need not be owned individually, can be owned and used cooperatively. These rural agencies will also be helpful to the proposed central and regional agencies by providing information on user's preferences of agricultural implements and incidence of seasonal demands. Further, to popularise the use of agricultural machinery, these agencies can also arrange for demonstrations, and establishment of servicing facilities in villages. Gaon panchayats or village cooperative societies are best suited for such activities.

3. Every State should have in its Agricultural Engineering Section a whole-time officer for conducting research on indigenous tools and implements and for testing improved and imported implements.

4. At present, the main problem faced by all the sections of the industry is that of the shortage of raw materials particularly iron and steel and non-ferrous metals. The demand for these raw materials is expected to increase considerably with the implementation of the different expansion and development schemes envisaged by the industry. Larger allocations of pig iron and steel quotas to the industry would, therefore, have to be made even if they have to be at the cost of some of the less essential industrial consumers if the programme of increased food and agricultural production is to be successfully carried out.

5. While the present allotments of steel quotas on a quarterly basis hinders long-range planning of the industry, it is difficult for the Government to anticipate the possible production of the main steel producers over a much longer period. However, the

possibility of allotments on a six-monthly basis should be examined by the licensing authorities.

6. The policy of certain State Governments of withholding the supply of iron and steel to manufacturers unless they are prepared to produce the finished products within the boundaries of their own States should be examined by the Ministry of Commerce and Industry in consultation with the manufacturers.

The tables below indicate the development programme for power-driven agricultural machinery, *viz.*, power-driven pumps (centrifugal) and diesel engines during the period of the Plan:—

Power-driven Pumps (centrifugal)

	Unit	1950-51	1955-56
Annual rated capacity	Numbers	33,460	69,400
Actual production	,,	34,310	80,000 to 85,000

Diesel Engines

	Unit	1950-51	1955-56
Annual rated capacity	Numbers	6,320	39,725
Actual production	,,	5,540	50,000

4. AUTOMOBILES

In spite of the importance of automobiles in modern transport, the manufacture of automobiles is still in its infancy in India. The industry has so far developed on the basis of assembling vehicles from imported components, but is gradually changing over to the manufacture of components and functional parts.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There are twelve firms in the country (three in Calcutta, six in Bombay and three in Madras) all of which started with an assembling programme, and five of them have plans to undertake manufacture of components and, finally, complete vehicles. However, so far only two firms—Hindustan Motors Ltd. (Calcutta) and Premier Automobiles Ltd. (Bombay)—have made any appreciable progress in this direction. These two firms, therefore, have been accepted in this plan as the two principal units engaged in the manufacture of automobiles.

According to present estimates, the assembling capacity of Hindustan Motors and Premier Automobiles is sufficient to give an annual output of 18/19,000 and 12,000 automobiles respectively. The total assembling capacity of the industry as a whole has been estimated at about 70,700 units, but production has been considerably below capacity as may be seen from table below:—

	1948-49	1949-50	1950-51	1951-52
Hindustan Motors	2,608	2,310	2,061	4,142
Premier Automobiles	6,206	3,485	2,016	2,496
Total including all other assemblers . .	29,183	18,135	16,519	23,576

(b) *Capital and labour.*—The total paid-up capital of the industry (both assembling and manufacturing units) is approximately Rs. 9·3 crores. Of this Hindustan and Premier have invested over Rs. 7 crores. It is considered that further investment of the order of Rs. 3 crores is still necessary to enable them to complete their programme of manufacturing an increasing percentage of components within the country.

The total labour employed in the industry is about 8,000 of which nearly a third are employed by Hindustan and Premier.

(c) *Raw materials.*—The more important raw materials required for manufacturing automobiles are:—

(1) pig iron and steel in the form of bars, tubing, plates, etc.,

(2) non-ferrous metals and alloys such as mercury, chromium, manganese, cadmium, brass, bronze, etc., and

(3) various manufactured materials coming under the description of metals, non-metals, textiles, chemicals, etc.

Of these raw materials, iron and steel are the most important. For instance, in all low-priced vehicles of American make, steel accounts for 72 per cent. of the total material requirements and iron 15 per cent. A number of items required by the industry are manufactured in the country, but articles like cold-drawn strips, precision-drawn straight and alloyed steel bars, terne plates, etc., are imported.

(d) *Imports.*—The number and value of motor vehicles imported into the country during the last five years are given below:—

Year	Motor cars including taxi cabs	Motors, omnibuses, motor vans, motor lorries	Total	Value in Rs. (lakhs)
	(Numbers)	(Numbers)	(Numbers)	
1947-48	23,197	12,217	35,414	15,14
1948-49	18,012	21,239	39,251	17,08
1949-50	7,159	11,455	18,614	9,30
1950-51	8,349	4,807	13,156	6,27
1951-52	9,957	4,712	14,669	7,75

Since imports are at present restricted mainly to vehicles in c.k.d. condition, the import figures reflect the extent to which assembling capacity in the country is being utilised.

(e) *Estimated consumption and requirements.*—It is estimated that the annual demand for motor cars and vehicles is in the neighbourhood of 25,000 excluding the requirements of the Defence Ministry. Approximately, 40 per cent. of these are trucks and the balance motor cars. The total number of automobiles registered in India in 1951 has been estimated at 252,000.

The demand for automobiles is closely connected with and dependent upon the general economic development of the country, the level of incomes of the people and on the prices of cars. The annual requirements of automobiles during the period of the Plan are not expected to be appreciably higher than at present.

II. Problems of the Industry

Among the main problems facing the industry the following may be mentioned:—

(*a*) limited demand for automobiles in the country;

(*b*) scarcity and non-availability of some of the raw materials required by the industry;

(*c*) absence of ancillary industries; and

(*d*) competition between assemblers and manufacturers.

The limited demand for automobiles is primarily due to the low standard of living in the country. There is hardly any likelihood of such an increase in the standard of living during the next five years as would have an appreciable effect on the demand for automobiles. Nor is there much prospect of a reduction in prices for some time to come.

Shortage of certain principal raw materials like special type steels has been a serious handicap for the industry. Most of these specialised materials are not produced in the country and have to be obtained from abroad.

In other countries, the automobile manufacturer himself does not, as a rule, produce more than a certain percentage of the components. He obtains his requirements from ancillary industries. A majority of such producers are small units acting as feeders to the automobile industry. In India, this type of development has not yet taken place with the result that the manufacturers have either to produce such components in small quantities or to import them. The limited demand for such components, owing to the limited development of the automobile industry, and the absence of standardisation have been serious obstacles to the growth of such ancillary industries.

For a healthy development of the automobile industry it is necessary to develop its manufacturing side rather than mere assembly. Assemblers of automobiles require much less capital investment and their profit margin is greater, so that they have considerable advantage over the manufacturers. At present encouragement and weightage is given under the import policy in favour of firms who have a definite manufacturing programme as against assemblers but this is not adequate. It is obvious that import policy could be a useful instrument for encouragement to manufacturers and should be utilised to a greater extent for the purpose.

III. Programme of Development

(a) *Existing programme.*—(i) *Programmes of the two recognised manufacturers in existence.*—It has already been mentioned that the two principal manufacturing firms—Hindustan Motors and Premier Automobiles—have in hand immediate plans for increasing both in volume and range the manufacture of components required by them in the assembly of automobiles.

Hindustan Motors are erecting a foundry and forging plant which on completion will help to reduce the price of imported components in the cars assembled at their works. At present, the value of imported components per car is about 35 per cent. of its selling price (Rs. 3,200—3,500 out of Rs. 9,975) and it is expected to go down by another Rs. 700 to 800 per car.

Premier Automobiles who are at present manufacturing radiators, mufflers, propeller shafts, springs and shock absorbers expect to produce within a short time transmission and differential equipment and later to undertake the production of engines.

(ii) *Manufacturing programmes of other companies.*—Apart from the two firms mentioned above, some of the other firms have also programmes for manufacturing certain automobile components. The important items of these programmes are mentioned below :—

Name of Firm	Components to be manufactured
India Pistons Ltd.	Pistons, cylinder liners and gudgeon pins.
Sanghani Motor Industries	U-Bolts ; shafts, shackle plates, king pins ; grease retainers ; battery carriers strips ; valve guides, etc.
Wheel and Rim Co. of India	Wheels and rims.
Rylands Brothers	Automobile springs.
Rayala Corporation, Ltd.	BEHR Radiators.
Simpson & Co.	Sparking plugs.
Motor Industries Co., Ltd.	Sparking plugs ; electric horns.
Union Co. (Motors), Ltd.	Electric horns ; hand and foot pumps.

(b) *Recommendations.*—(i) In view of the limited size of the Indian market for motor vehicles, it is necessary that production should not be dispersed among a large number of manufacturing units functioning on an uneconomic basis but should be concentrated in a few manufacturing units. Since a large amount of capital has already been invested by the two units, *viz.*, Hindustan Motors and Premier Automobiles, which have already made some progress with their manufacturing programme, it will be desirable to encourage these units to expand production to their full capacity.

(ii) The continuance of the units which do not at present have any manufacturing programmes should depend on their adoption of a phased programme of production of functional parts and investment of sufficient capital for the implementation of that programme.

(iii) The policy of " weighted " imports being allowed in favour of the manufacturing units should be continued in the future, so that the imports of those units which are engaged in assembly work alone are progressively reduced and eliminated.

(iv) The manufacturing programmes (present and proposed) of the Hindustan Motors and the Premier Automobiles should be examined to ascertain whether they are technically sound and whether their implementation would result in the manufacture of vehicles at a price which would permit of an expanding demand.

(v) The possibilities of either integration or mutual assistance and co-operation of existing manufacturers/assemblers should be examined with a view to utilising the total existing capacity to the best advantage and promoting the development of the automobile industry as a whole.

(vi) The development of ancillary and subsidiary industries manufacturing components required by the manufacturing units with approved programmes of production and for the replacement and maintenance of vehicles in the country should be encouraged by suitable measures.

(vii) An important step for encouraging the growth of ancillary and subsidiary industries would be the standardisation of the various types of components so that the manufacturers of components are able to produce to uniform specifications.

(viii) In order that the recommendation at (vii) above may be fully implemented, it would be necessary to reduce the number of models and makes of vehicles allowed for use in the country. The State Governments and other principal consumers should, therefore, be advised to limit their purchases to such models and makes of vehicles as are manufactured by the units with approved manufacturing programmes.

(ix) The economics of diesel-driven transport vehicles and the desirability of taking measures to restrict, regulate or co-ordinate their use with the use of petrol-driven vehicles should be examined.

(x) A detailed scheme for a co-ordinated manufacturing programme should be worked out by a team of experts who should examine the facilities available at the various factories and suggest the best method of utilising them in the national interest. After such a scheme has been worked out, the Government should examine what assistance should be rendered for its speedy implementation either by a change in the existing rate of imports of components of motor vehicles, or by the grant of a subsidy or a combination of both these methods.

The Government have referred the question of the future development of the indigenous automobile industry to the Tariff Commission and several of the recommendations above have been included in the terms of reference. The recommendations of the Tariff Commission have to be awaited before the detailed planning of the industry can be undertaken.

The following table summarises the development programme of the automobile industry during the period of the Plan:—

	1950-51		1955-56	
	Assemblers	Manufacturers	Assemblers	Manufacturers
Number of units	10	2	—	2*
Rated capacity	41,700	30,000	—	30,000
†Actual production	12,442	4,077	—	30,000

* It is assumed that none of the assemblers are likely to take up a manufacturing programme.

† Production of manufacturers only.

5. RAILWAY ROLLING STOCK

The railway system, with a mileage of over 34,000, is the most important means of transport and communication in India and is vital both from the point of view of economic development and defence. In 1950-51, it carried 108 million tons of freight and 1,129 million passengers. Railways constitute the single largest consumer of steel produced in the country and with their normal demand for locomotives, wagons and coaches can easily support the existing industries for manufacturing rolling stock on an economic basis.

A. Locomotives

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—At present there are two locomotive manufacturing works, one at Chittaranjan in Bengal, a new township close to the coal belt and to the site of the proposed Maithon Dam of the Damodar Valley project, and the other at Tatanagar in Bihar, one of the most important centres of industrial activity in the country. The Chittaranjan factory is wholly owned and managed by the Government, while the Tatanagar Works are owned and managed by the Tata Locomotive & Engineering Co. Ltd., (TELCO), but a portion of its share capital is subscribed by the Government. Both the works are well advanced.

The Chittaranjan factory is practically complete and a large range of components for the W. G. class 2-8-2 freight locomotives, on order with it, are already being manufactured. The range and volume of its production is being gradually increased. The first locomotive was assembled in November 1950, and 27 complete W. G. locomotives were turned out up to the end of April 1952. When in full production (*i.e.*, 1957) the factory will have the capacity to produce 120 locomotives and 50 boilers per annum, based on single shift working.

At the Tatanagar factory 148 locomotive boilers had been manufactured upto the end of April 1952. The assembly of the first lot of 50 YG class metre gauge freight locomotives on order has also been commenced and 13 of these locomotives had been turned out upto the end of April 1952. This order is expected to be completed by August, 1953. Two more orders for 50 YP class metre gauge passenger locomotives each have been placed on this factory which are expected to be completed by October 1954 and September 1955 respectively.

(b) *Capital and labour.*—The total capital invested in the Chittaranjan factory, including the staff colony, up to February 1952 was Rs. 13·02 crores, and is expected to reach Rs. 14·93 crores when the project is fully completed. Of this total, about half represents expenditure on the township and staff amenities. At the end of 1950, the investment on the Tatanagar works was Rs. 4·5 crores and a further sum of Rs. 2·5 crores will be required to complete the factory.

The labour strength of the Chittaranjan factory is about 5,000 and that of the Tatanagar factory 3,034. The latter is expected to increase to 4,500 when the factory is in full production.

(c) *Raw materials and techniques.*—At present, there is a shortage of steel and other metals which constitute the most important raw materials of this industry. Although steel,

the principal raw material, is produced in the country, the present output is not sufficient to meet the total requirements. On the other hand, certain proprietary fittings and other components such as large and complicated steel castings, special mountings and fittings, boiler tubes and patented parts are not produced in the country and have to be imported. This is, however, also the case in many more industrialised countries where locomotives have been manufactured for many years. It has been estimated by TELCO that for annual production of 50 locomotives and 50 boilers, approximately Rs. 1·2 crores worth of raw materials will have to be imported.

Arrangements have been made for the Chittaranjan factory to receive full technical aid from the Locomotive Manufacturers' Association of the U. K. for the first five years of production. Similarly, the Tata Locomotive & Engineering Co. has an agreement with a leading German Locomotive firm, Messrs. Krauss-Maffei of Munich which provides for up-to-date technical advice and the services of skilled engineers and technicians as well as for the supply of such castings and components as might be difficult to produce in India in the initial stage. A technical team is already working at Tatanagar and arrangements are being made to bring out more technicians from abroad. The Railway Board have also developed a locomotive design and consultant section manned by Indian experts.

(d) *Imports.*—Figures of imports of locomotives for the last four years and expected imports during 1952-53 are given below. It is necessary to point out that imports were limited primarily by the supply conditions abroad.

Imports of locomotives

Years	Numbers	Value (Rs. lakhs)
1948-49	149	4,54
1949-50	432	19,03
1950-51	220	8,79
1951-52	80	3,00
1952-53 (estimated)	207	20,80
1953-56 („)	313	

(e) *Estimated requirements.*—The total number of locomotives of all gauges held by the Indian Railways in March 1951 was 8,209 and in March 1952 the number was 8,294. A number of these locomotives, however, are uneconomical in operation either due to deterioration or advanced age. This situation has arisen largely because during the war and for some time after, normal replacements were not effected due to procurement difficulties and this has also been the case in recent years owing to limitations being placed on railway expenditure. On 1st April 1951, against a normal wastage of 190 locomotives per annum, there were 1,050 locomotives due for replacement. In addition it is expected that 1,042 locomotives will become due for replacement during 1951-56. It is expected that once the accumulated arrears of repairs and replacements are overtaken, the present level of traffic can be moved with about 7,500 locomotives of an average age of 20 years, as against the present average age of about 30 years. When the average age is brought down to 20 years, the annual replacement requirements would be approximately 185 locomotives. This number is well within the full productive capacity of the two factories and if the demand increases it can still be met to an appreciable extent by operation of the two factories on a double shift basis.

II. Programme of Development

The production schedule of the Chittaranjan factory is given below:—

End of year	Number of locomotives	Percentage of components to be produced in India
1951 (April to December)	12	70
1952	30	80
1953	45	100
1954	66	100
1955	90	100
1956 (January to March)	25	100

Similarly, the Tatanagar factory is expected to reach full production only in 1954-55, when the target production of 50 locomotives and 50 boilers per annum, on a single shift basis, will be achieved.

Since the projected capacity of the industry, when fully developed, would be sufficient to meet the expected annual demand, except for a few special narrow gauge locomotives, there does not appear to be any necessity to plan any increase in the manufacturing capacity at present. There is some room for expansion at both Chittaranjan and Tatanagar, and if necessary, increased output could also be secured by operating additional shifts. A steel foundry for large sized castings is, however, lacking and is urgently required by both the locomotive works.

B. Wagons

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—This industry has been in existence in India for about 30 years, producing rolling stock which in quality is comparable with the best rolling stock manufactured abroad. At present, the following four firms are engaged regularly in this industry:—

1. The Indian Standard Wagons Ltd., Burnpur.
2. Messrs. Jessop & Co., Calcutta.
3. Messrs. Burn & Co., Howrah.
4. Messrs. Braithwaite & Co., Calcutta.

In additions railway wagons of any type can be built in Railway Workshops, if necessary. Messrs. Arthur Butler's Works at Muzaffarpur, Bihar; Messrs. Textile Machinery Corporation, Belghuria (W. Bengal); the Punjab Government Workshops, Amritsar; Kumardhubi Engineering Works, Kumardhubi; and Messrs. McKenzie of Bombay are also trying their hands at educational orders.

The four firms mentioned above together have a rated capacity of about 6,000 wagons per annum. It should be possible to increase this capacity gradually by 20 to 25 per cent., provided the supply of raw materials improves and labour conditions become more favourable. So far the capacity of these firms has been adequate to meet normal replacement demands. The Railway workshops have not so far undertaken the manufacture of wagons to a regular programme, but have concentrated on other work.

The actual production of wagons in recent years, which has been much below the installed capacity is shown in the following table :—

Production of wagons in units.

Year	Numbers
1948-49	2,520
1949-50	1,095
1950-51	2,924
1951-52	3,925

(b) *Capital and labour.*—Since all these firms carry on other activities besides the manufacture of wagons, it is not possible to estimate the capital invested and labour employed in the manufacture of wagons alone.

(c) *Raw materials.*—The main raw material required for the manufacture of wagons is steel which is in short supply. The supply of wheels, axles and tyres is also not sufficient at present. It is expected that the position will ease considerably when the expansion plans of the Tata Iron & Steel Co. and of the Steel Corporation of Bengal are implemented.

(d) *Imports.*—The number of wagons imported during the last four years (1948-49 to 1951-52) and the magnitude of anticipated imports during 1952-56 are given below. Imports in the past were low primarily due to limitations of supply and Railway finance:—

Imports of goods wagons (in units).

Year	Numbers
1948-49	2
1949-50	348
1950-51	233
1951-52	2,459
1952-53	1,744*
1953-54	5,460*
1954-55	4,740*
1955-56	4,740*

(e) *Estimated requirements.*—The holding of wagons of all types by the Indian Railways (all gauges) was estimated to be 225,000 in March 1952. If properly serviced and maintained, they have an average economic life of about 40 years. But, during the war, the normal replacement of wagons was not possible and therefore a large proportion of the present stock is overage. The arrears of replacement in March 1951 were estimated at 21,418 and during the period of the Plan (1951-56) about 26,115 wagons will become due for replacement. To overcome the arrears of replacement and provide for current renewals it will be necessary to add at least 10,000 (about 5,000 for normal replacement and the balance for past arrears) per annum till the close of the period of the Plan. Once the arrears are cleared, the normal annual demand is not likely to be much more than 6,000 wagons and this can be met from the present installed capacity provided there are no difficulties in the procurement of materials and labour conditions are normal.

II. Programme of Development

Since the existing installed capacity is sufficient to meet fully the normal requirements for replacement it is not necessary to expand the installed capacity at present. In case

*Anticipated imports for which provision has been made.

of emergency, the reserve capacity can be utilised. The objective should, therefore, be to utilise the present capacity fully and regularly so that the replacement programme can be completed expeditiously. It is estimated that the indigenous industry would have to produce 30,000 wagons during the period of the Plan for which necessary financial provision has been made in the Railway Plan.

C. PASSENGER COACHES

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—For the last half a century, almost the entire requirements of railway coaches in the country (except electrical multiple unit stock) have been met by the Railway workshops, only certain important components like wheels, axles, underframes, and electrical equipment had to be imported. Since the last world war, however, some of these items also are being manufactured in India, although not always in sufficient numbers. Coach building is also undertaken now by other Government and private concerns, namely, the Hindustan Aircraft Ltd., the Indian Standard Wagon Co. Ltd., and Messrs. Braithwaite & Co. Ltd.

The Hindustan Aircraft Ltd., Bangalore, have plans to increase their capacity to build from 100 to 180 bogie passenger coaches per annum, and these plans are progressing satisfactorily. The other firms can together produce up to 250 bogies per annum, provided the manufacturing programme is carefully planned in advance and the necessary supplies of raw materials are ensured. In addition, the Railway workshops have an annual capacity of about 500 bogies. The Tata Locomotive & Engineering Works have capacity to manufacture about 400 bogie underframes per annum. After completing the current orders for underframes, however, this work is likely to be given up by TELCO for some other lines of manufacture.

Figures relating to production of railway coaches and underframes since 1948-49 are given below:—

Production of coaches and underframes

Year	Coaches (Numbers in units)	Underframes (In terms of 4 wheels)
1948-49	238	118
1949-50	337	1,540
1950-51	479	584
1951-56	4,380 (anticipated)	*N.A.*

It is expected that 4,380 coaching vehicles in units will be required to be produced indigenously and 1,294 imported during the period of the Plan. According to these figures, production of passenger coaches in the past was much below the capacity. This was due primarily to shortage of materials.

(b) *Raw materials.*—The important raw materials of this industry are steel, wheels and axles and springs, all of which are in short supply. Since it has now been decided to standardise all-steel passenger coaches, timber is no longer of major importance.

(c) *Imports.*—There has not been any import of coaches during the three years 1948-49/1950-51; but for the next few years imports are likely to be very large. The anticipated imports for the period of the Plan are given below:—

Year	Coaching Vehicles (in units)
1951-52	98
1952-53	274
1953-54	292
1954-55	315
1955-56	315

(d) *Estimated requirements.*—The arrears of replacements as well as current replacements during the period of the Plan are estimated at 5,514 and 3,021 coaching vehicles respectively. As against requirements of that order actual availability is expected to be about 5,674 units so that the programme of replacements will have to be extended over a longer period.

II. Programme of Development

To fill the gap between manufacturing capacity and demand, the expansion programme of the Hindustan Aircraft factory works is already under way, and plans have been finalised for the construction of a workshop at Perambur (Madras) at a cost of about Rs. 4 crores, with a capacity to build, on the basis of a single shift, 300 to 350 all-steel integral type coaches per annum. This factory is expected to be in production by 1955 and reach full production by 1957. The production of this workshops in 1955-56 is expected to be 50 coaches. The question of setting up a new unit to manufacture underframes at Chittaranjan, is also under consideration, in case TELCO gives up this line of work.

The industry has maintained close touch with the technique of manufacture in other countries. Indian Railway designers and manufacturing experts have visited leading factories in Europe and America as necessary and, as a result, Indian manufacturers (both Railway workshops and private firms) have been able to adapt modern technique to suit Indian conditions.

General Recommendations

Raw materials.—The manufacture of rolling stock in India is handicapped by the shortage of steel. The increase in production of pig iron and steel envisaged under the development programme of that industry may partly ease the problem. But if shortages continue, it will be necessary to meet part of the requirements of the industry through imports. Similarly, it may be necessary also to import certain special components, the manufacture of which is not economical in India.

A. Locomotives

It is necessary to treat locomotive manufacture as a top priority project so as to ensure that the completion of the two manufacturing works takes place according to schedule. Even after completion, it will be necessary to see that difficulties in regard to finance, technical personnel, imports of machinery and equipment do not impede production at full capacity. In this connection, a modern steel foundry that can produce 5,000 tons per annum of large size, heavy and sometimes intricate loco-castings, is urgently required.

B. Wagons

Steps have to be taken to ensure that the producers of wagons receive a regular and adequate flow of raw material supplies, primarily steel, wheels, axles and tyres and that orders are carefully planned about 2 years ahead.

C. Passenger Coaches

High priority should be accorded to the construction of the Coach Building Factory at Perambur and the setting up of manufacturing facilities for bogie carriage underframes at Chittaranjan.

The table below indicates the development programme of the Railway rolling stock industry during the period of the Plan.

	Locomotives (Numbers)	Wagons (Numbers)	Coaches (Numbers)
Estimated production (1951-56)	438	30,000	4,380
Estimated imports (1951-56)	600	19,143	1,294

6. SHIPBUILDING

Shipbuilding is one of the heavy engineering industries on which the naval strength and maritime supremacy of the leading nations of the world has been built. Whereas the Navy guarantees the security of the coast line in periods of war, cargo and passenger ships constitute an important source of foreign exchange by acting as carriers of passengers and commodities.

I. Brief Survey of the Industry

The establishment of a shipbuilding industry in the country is a necessary corollary of reservation of the coastal trade to national shipping and of the increasing participation of Indian vessels in overseas trade. Targets for the expansion of shipping have been provided in the Five-Year Plan. The plan for shipbuilding centres round the shipyard at Vizagapatam, the foundation of which was laid in June, 1941. During the last war, several ships under the Indian flag were lost owing to enemy action and replacement by building of new tonnage in other countries was nearly impossible. This venture of a shipyard was pioneered by the Scindia Steam Navigation Company but because of the difficulties created by the war, the keel of the first ship was laid only in 1946. Between that date and May, 1952, the Company has built eight cargo ships, each of 8,000 dead weight tons, four for its own fleet and four to Government order, which have been classed by Lloyds as " + 100 - AI ", the highest classification for such vessels. In addition, one small ship for the carriage of unberthed passengers was also completed at the shipyard.

The Vizagapatam shipyard was designed by the well-known firm of Sir Alexander Gibb & Partners. It covers a 55-acre site and has two building berths each equipped to build ships ranging from 320 to 550 ft. in length and from about 5,500 tons to about 15,000 tons dead weight capacity. A third berth of similar capacity is under construction and will be ready towards the end of 1952. The yard is also equipped with a fitting-out wharf 1,200 ft. long which will be capable of fitting-out of 6 large ships and 3 medium-sized ships in one year. On the engineering side the hull and structural shop has a fabricating capacity of 8,000 tons of steel per annum which allows for simultaneous fabrication of the hulls of three 8,000/10,000 D.W.T. cargo ships. From the standpoint of transport facilities, it is linked with the Eastern Railway system by a special siding which was recently completed.

The shipbuilding yard provides work for 3,800 employees, 50 per cent. of whom are skilled. In June, 1950, the amount of capital invested in the yard, inclusive of the value of raw materials in stock, was about Rs. 4·34 crores. Of this amount, Rs. 75 lakhs represent the investment on the staff colony with facilities for roads, drainage, water supply, electricity, etc.

Raw materials.—Apart from the propelling and auxiliary machinery and navigational equipment, the principal raw materials required are steel and timber. The several categories of steel that go into the construction of a cargo vessel are: plates, heavy structurals, light structurals, bars, black sheets, G. I. sheets and blooms. Timber is required for sheathing decks, awnings, hatches, ceilings and bulkheads, sparring, cabin partitions, furniture and miscellaneous jobs.

On the basis of the present capacity of the yard, the entire quantity of steel, 80 per cent. of the stores and 35 per cent. of the timber required for shipbuilding is available from

indigenous sources. Even if the capacity increases, the position would not materially alter except perhaps in regard to steel a part of which might have to be imported. The whole of the propelling and auxiliary machinery and equipment and a part of the stores have on the other hand to be imported and the same is the case with some special types of timber which have to be obtained from Burma and Canada. The foreign exchange requirements on account of raw materials may be estimated at Rs. 20 lakhs for every 8,000 tonner.

II. Future Demand for Ships

Some idea of the scope for the development of the shipbuilding industry in the country can be had from the fact that although the value of India's foreign trade during the last two years amounted roughly to Rs. 1,000 crores per annum and that of the coastal trade to more than Rs. 100 crores, only a very small fraction of this was carried in Indian ships. The proportion of Indian shipping to the total shipping tonnage that entered Indian ports and cleared in 1950 and 1951 was 2 per cent. and 2·96 per cent. respectively. The aggregate Indian owned shipping registered for operation on coastal and overseas routes was 384,400 gross registered tons at the end of 1951. When this tonnage is set against the target of two million tons of shipping recommended by the Shipping Policy Committee (1947), it becomes clear that an enormous leeway has yet to be made up.

Though it would not be possible to achieve the target recommended by the Shipping Policy Committee in a short period, it is necessary to provide Indian shipping companies with additional tonnage during the next five years in consequence of the decision to reserve the coastal trade of the country to Indian-owned ships. To implement the programme of coastal reservation, the volume of Indian-owned tonnage on the coastal trade will have to be increased from 210,976 G.R.T. at the end of 1951 to about 300,000 G.R.T. by 1955-56. It is also necessary during this period to replace several ships operating on the coast which are at present over 20 years of age.

Additional tonnage has also to be acquired by the Indian Companies engaged in overseas shipping, so that they may participate as better economic units in certain overseas routes in which they operate today and begin to operate in others such as India—Far East—Japan, which are of vital importance, and also so as to fulfil certain commitments with the shipping conferences as to the tonnage which has to be added by them by a certain date.

Taking into consideration all these requirements against the background of alternative demands on the finance available for investment in the public as well as the private sectors during the coming five years, a target of 600,000 G.R.T. has been fixed for being attained by 1955-56. In connection with the acquisition of additional tonnage for fulfilling this target, the shipbuilding yard at Vizagapatam is to play a significant role and plans for its expansion have accordingly been formulated.

III. Programme of Development

(a) In deciding upon the appropriate plan for the development of the Vizagapatam Shipbuilding Yard it is necessary to make an examination of the various factors which have so far been responsible for the high cost of shipbuilding during the last few years. The most important factors contributing to the high cost of ships are :—

(i) Whereas 6-7 berths are necessary for economic operation, the shipyard is only equipped at present with two building berths. Even after the completion of the third berth under construction during the course of 1952, it would be far below an economic size.

(ii) The construction of the shipyard under inflationary conditions during the war and the non-availability of the most "economic" material and machinery have resulted in heavy capital expenditure.

(iii) Even despite its small capacity the shipyard has not been employed fully.

(iv) The propelling and auxiliary machinery which has to be imported from abroad, the low level of technical skill of the personnel which has had to be trained wholly within the shipyard and the absence of ancillary industries have also contributed to the high cost.

(v) The 'idle' labour in existence is nearly one-third of the total labour force employed and this is also partly responsible for the high cost of construction.

As a result of the factors mentioned above, the cost of an 8,000 ton ship built at Vizagapatam worked out to about Rs. 63 lakhs which does not compare unfavourably with the cost in the U. S. A., Italy, Canada and Australia, but is far in excess of the price quoted by the British Shipyards which is round about Rs. 48 lakhs. To make good this difference in cost, the Government have been paying a "differential cost" subsidy on vessels built in the shipyard on their account. The subsidy is to be regarded as a temporary relief and measures for the expansion of the yard to economic size have to be taken for achieving a lasting improvement in the domestic shipbuilding industry and for reducing the amount of subsidy.

(b) *Development Plan*.—The Scindia Steam Navigation Company found itself unable to raise the necessary finance for continuing the operation of the yard and for the last two years the Government have advanced money for the construction of ships on their account so that the yard might not be closed. Considering the basic importance of the shipbuilding industry, the Government have taken over the shipyard and operate it in partnership with the Scindia Steam Navigation Company. For this purpose, a private limited company called the Hindustan Shipyard Ltd., was registered and the transfer of the shipyard to the new company took place on the 1st March, 1952. The Government have spent a sum of Rs. 231·6 lakhs in 1951-52, the details of which have been shown in the table below. After the transfer of the shipyard in March, 1952, a Five-Year Plan for its development was formulated which was estimated to cost Rs. 15·82 crores, between 1952-53 and 1956-57. Out of this development expenditure, a sum of Rs. 11·77 crores is envisaged to be spent during the four years ending 1955-56. Taking into account the expenditure in 1951-52, the financial requirements for the period 1951-56 would, therefore, be Rs. 14·08 crores. The annual break-up of the expenditure is visualised as under :—

Finance for the Shipbuilding Industry

(In lakhs of Rupees)

	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57
Acquisition of Yard	39·6	40·0	40·0	40·0	40·0	7
Development of the Yard	10·0	100·0	110·0	110·0	145·0	150·0
Loans against ships built at the Vizagapatam Yard.	182	100·0	50·0	50·0	120·0	180·0
Subsidy		42·0	60·0	60·0	70·0	70·0
TOTAL	231·6	282·0	260·0	260·0	375·0	407·0

It is unlikely that the Hindustan Shipyard Ltd. will be able to do without a subsidy for some years to come although the quantum of subsidy might be reduced considerably after the completion of the development project the details of which are as under:—

(i) Construction of one large and one small berth.

(ii) Increasing the capacity of the hull shop and machine shop; construction of a foundry and pre-fabricating shop; reconstruction of the wood-working shop and improvement of the jetty.

(iii) Establishment of a shop for building engines and boilers and other auxiliaries.

(iv) Improvement of housing for personnel. The plan for the manufacture of engines and boilers is an important aspect of the development plan which, on implementation, would safeguard the yard against uncertainties of supplies from foreign countries in times of emergency. However, during the period of the Plan the shipyard would have to continue to obtain its requirements of propelling machinery from foreign sources.

(c) *Sale of ships built at the yard.*—With the implementation of the development plan the shipyard would also be able to turn out cargo ships of 10,000 D.W.T. required for overseas trade so that while most of the ships built at the yard would be used for the replacement of overage vessels and for augmenting the tonnage on the coastal trade, there would also be a few vessels built for operation on overseas routes during the five years period ending March, 1956. It is expected that 19 to 20 ships will be built at the yard corresponding to 150,000 D.W.T. (equivalent to 100,000 gross registered tons) out of which 60,000 G.R.T. might be utilised for replacement purposes. In view of the fact that the shipping companies do not have adequate resources for outright purchase of ships, the disposal of ships built at the yard is proposed to be facilitated on the basis of cash payment of one-third of the sale price and payment of the balance in easy instalments extending over 5-10 years. It is, however, assumed that the Eastern Shipping Corporation and the Navy would pay the entire sale price at the time of the acquisition of the ships so that the provision of finance towards the loan advances is lower than what it would otherwise have been.

(d) *Collaboration with foreign shipbuilding companies.*—With a view to obtaining the necessary technical assistance for the implementation of the development plan, the Hindustan Shipyard Ltd., has entered into an agreement with *La Societe Anonyme des Ataliers et Chantiers de la Loire de Paris* (ACL) from 15th July, 1952 for a period of 5 years. Under this agreement the French firm (ACL) will provide mechanical advice in regard to organisation, development and management of the shipyard at Vizagapatam and the building of ships, vessels, navalcraft, engines and all forms of ship equipment. Further, it will help in establishing a fully equipped and competent designing and estimating office at the site of the yard and use its best endeavours in obtaining from France and other countries the supply of steel, equipment, stores and all other shipbuilding materials not locally available. Another important line in which the ACL has agreed to assist the shipyard is in respect of training the Indian staff in their establishments in France so as to fit them for positions of the highest responsibility in each department. In consideration for the above and certain other services, the Hindustan Shipyard Ltd., will pay the ACL a sum calculated at 4 per cent. per annum of the turnover of the company.

(e) *Recommendations.*—(i) In view of the difficulties faced by the shipping companies in acquiring additional tonnage from foreign countries, the development of the Vizagapatam

Shipyard assumes special importance and Government should provide all necessary facilities to the Hindustan Shipyard Ltd., for the implementation of the development plan.

(ii) The steel plate produced by the plate rolling mill of the Tata Iron and Steel Co. (TISCo), does not conform to the exact specifications required for shipbuilding in respect of size and thickness. In consequence, about 100 tons of extra steel have to be used for every vessel 8,000 D.W.T. constructed at the Vizagapatam Shipyard. There is also a wastage of about 300 tons. The expansion plan of the TISCo, provides for improvements to plate mill which would result in an additional output of 40,000 tons of plate. While rebuilding the plate mill, TISCo, should consider the possibility of producing steel plate of the desired thickness and width for meeting the requirements of the shipbuilding industry.

(iii) The production programme of the Vizagapatam Shipyard should be co-ordinated with the programmes for the purchase of tonnage by the shipping companies so that the yard is utilised to its full capacity. This co-ordination would ensure achievement of economies in cost of production and in the amount of subsidy that will have to be paid by the Government.

7. MACHINE TOOLS

Machine tools, often described as " machines that make machines ", are power-driven appliances for precise shaping of metal parts from raw or semi-processed materials, rough castings, forgings or rolled sections, etc., by removing excess metal by cutting. These are essentially capital goods used mainly in the heavy mechanised industries and in the manufacture of locomotives, ships, aeroplanes, radio electronic equipment, agricultural and textile machinery, armaments, etc. The machine tool industry is thus a basic and strategic industry, vital to general industrial development as well as national security.

I. Brief Survey of the Industry

Prior to 1935, although a few firms manufacturing simple and primary types of machine tools for their own use were in existence, the country was almost entirely dependent on imports. Subsequently, the manufacture of machine tools was taken up on a commercial basis on a very limited scale by two or three firms but their combined output did not exceed a hundred machine tools per annum. With the outbreak of World War II and the consequent fall in the imports of machine tools, the Government encouraged some of the existing general engineering firms to undertake machine tool production. Accordingly, seven machine tool experts were invited from the United Kingdom; schemes were drawn up for balancing the plants of these firms and active assistance was rendered by the Government for facilitating the supply of raw materials and expert technical advice. Bulk orders for machine tools were placed on " cost plus " basis. Government Machine Tool Inspectors were posted at the premises of leading firms. As a result of these measures the industry made rapid progress and production expanded to about 4,000 machine tools (graded) in undivided India during 1945.

During the six years from September, 1939, to September, 1945, the number of machine tools built in the country and supplied through the Directorate General of Munitions Production (D.G.M.P.) was of the order of 20,000, valued at about Rs. 6 crores at an average price of about Rs. 3,000 each. During the same period machine tools imported by the D.G.M.P., excluding those directly imported by the Ministry of Defence, were 28,000 valued at about Rs. 33·6 crores at an average price of Rs. 12,000 each.

(a) *Location, rated capacity and production.*—The products of the machine tool industry are classified under three grades: I, II and III, based on alignment test charts, and the manufacturers are also graded according to the grade of machine tools produced by them. There are, at present, 14 manufacturers of graded machine tools (excluding 2 firms making ancillary equipment) and their total rated capacity is about 3,000 machine tools, per annum, valued at about Rs. 90 lakhs. The State-wise distribution of the industry is indicated below:—

State	Number of factories
Bombay	5
Bengal	6*
Delhi	2
Mysore	1
Hyderabad	1
Punjab	1*
TOTAL	16

*Including one manufacturer of ancillary equipment.

The Grade I machine tools manufacturers on a medium scale are: Messrs. Mysore Kirloskar Co. (Harihar), Messrs. Investa Machine Tools and Engineering Co. (Bombay), Messrs. Cooper Engineering Co. (Satara), Messrs. India Machinery Co. (Howrah), and Messrs. Maya Engineering Works (Calcutta). The geometrical accuracy specified for grade I machine tools closely follows the internationally recognised Schlesinger's test charts. In addition to the manufacturers of graded machine tools, there are 105 other small engineering workshops manufacturing machine tools which do not come up to the standards of accuracy laid down for graded machine tools. For the purposes of statistics, grant of protection and the present development programme, the production of these manufacturers of ungraded machine tools is not taken into consideration.

The maximum production so far recorded was achieved in 1946 and was valued at about Rs. 91·25 lakhs for the factories located in undivided India. Since then there has been a decline. The actual production during 1948, 1949, and 1950 is estimated at 1,692 (Rs. 54·72 lakhs) 2,240 (Rs. 47·29 lakhs) and 1,101 (Rs. 26·59 lakhs) machine tools respectively. Machine tools worth Rs. 41·0 lakhs were produced in 1951.

The present range of products of the industry includes mostly copies of old models of lathes, drilling machines, shaping machines, planing machines, chucks, presses, etc. The bulk of machines manufactured are simple and primary types of machine tools of old models which are mainly suitable for use by small-scale manufacturers, where the machines are used intermittently and high output and rigid adherence to specification standards are not essential. These indigenous machine tools have not been found suitable for use in Class I Railway Workshops, Ordnance Factories and certain other key industries, where the manufacture is essentially on production basis and where floor to floor time is fixed for each article to be machined and the production series cover large numbers and have to be completed economically within the shortest possible time.

(b) *Capital and labour.*—It is estimated that the total capital invested in the machine tool industry (graded) is about Rs. 90 lakhs and the total number of persons employed is about 1,500.

(c) *Raw materials.*—The principal raw materials required are pig iron, mild steel and non-ferrous metals; coal, coke, limestone and timber are also necessary. All these raw materials are available from indigenous sources. In addition, certain special alloy steels and components such as ball or roller bearings, etc., are also required which have to be imported from abroad. The quantities of raw materials required by the industry for working to full capacity (3,000 machine tools per annum) are as follows: about 3,600 tons of pig iron (valued at about Rs. 4·32 lakhs), about 900 tons of mild steel (about Rs. 3·4 lakhs) and about Rs. 2·5 lakhs worth of imported components and special steel.

(d) *Imports and exports.*—The value of machine tools (including other metal-working machinery) imported into India increased from Rs. 4,14 lakhs during 1948-49 to Rs. 4,20 lakhs during 1949-50, but went down to about 2,49 lakhs during 1950-51. The quantities of machine tools imported into the country are not known but reliable data is available regarding the imports from the United Kingdom, which is the main supplier of machine tools to India. The U. K. Board of Trade Returns show that during the half year ending December, 1948, the U. K. exported to India 3,622 tons of machine tools valued at £1·33 millions (U. K. port price). During 1949 and 1950, the exports to India stood at 7,600 tons valued at £2·479 millions, and 7,560 tons valued at £2·437 millions respectively. The above prices have to be roughly increased by 50 per cent. to cover freight, insurance, dock handling, customs duty, storage, sale agents' commission, etc.,

to arrive at the Indian market value. These exports from the U. K. have, however, shown a marked decline of about 50 per cent. during the first half of 1951 due to the implementation of the armament programme in the U. K. There is no appreciable export of machine tools from the country.

(e) *Estimated consumption and requirements*—(i) *Present consumption.*—In the absence of statistics relating to the quantity of machine tools imported into India, it has not been possible to estimate the quantity of machine tools available for consumption with exactitude. However, some rough idea of the total internal consumption can be framed, with the aid of certain assumptions, from the total value of indigenous production and imports, which together amounted to about Rs. 4,67 lakhs during 1948-49, Rs. 4,62 lakhs during 1949-50 and about Rs. 2,82 lakhs during 1950-51 excluding the machine tools released from the War Reparations' and Surplus Disposals' Stocks and the imports of machine tools through the blanket licences issued under the Capital Goods Scheme.

Till about the middle of 1948, there was a heavy demand for machine tools and more than 90 per cent. of the total indigenous production was consumed by private small-scale industries and other private parties. On the other hand, the Government's demand was confined only to a few machines since the indigenous products were generally considered unsuitable for Class I Railway Workshops, Ordnance factories and other essential services. Subsequently, however, a general recession set in and, moreover, many items of consumer goods were brought under the Open General Licence with the result that a number of small-scale manufacturers closed down. These factors have been mainly responsible for the recent heavy drop in the overall demand for indigenous machine tools. During this period, between 3,500 to 4,000 machine tools from War Reparations' stocks and between 1,000 to 1,500 machine tools from Surplus Disposals' stocks were released for sale at 40 per cent. of their current market value. They were, however, absorbed almost entirely by Government Departments, and were mainly of production type and completely different from the simple, primary and light types of machine tools generally produced in the country. Thus, there was no competition with the locally manufactured varieties. It is necessary to emphasise that while the quality of indigenous machine tools is technically poor, their cost of production is decidedly high. These drawbacks have also been to a great extent responsible for the shrinkage of demand for the indigenous products.

Present normal requirements of the modern precision and production type of machine tools are roughly estimated at about 1,710 machine tools per annum, of which 810 machine tools are estimated to be required by the Indian Railways and the Defence Services, and 300 each for other Government indentors, private industry and certain development projects. Import licences issued for such machine tools during the years 1947, 1948, and 1949 were for 1,680, 1,060, and 327 respectively. This excludes a number of blanket licences issued under the Capital Goods Scheme a part of which represented machine tools. There was no control over the blanket licences until two years ago, but since then vigilance is being exercised over all such licences. However, while the quantities of actual imports are not available, there is every reason to believe, having regard to the value of machine tools as given in the Sea-borne Trade Accounts, that on an average not less than 600 to 700 machine tools per annum were actually imported for private industry alone.

The import licences issued during the last two or three years cannot be considered entirely representative of the actual normal demand for machine tools by private industry. But after making due allowance for the fact that the offtake of such machines may have been somewhat greater than the normal demand because of the low price factor, the present

maximum demand for the precision and production type of machine tools may be estimated at about 1,500 machine tools per annum, valued at about Rs. 4 crores.

(ii) *Future consumption.*—The Machine Tool Panel had recommended a production target of 7,325 (graded and ungraded) machine tools in 1947-48 for undivided India, and had suggested that production should be increased by 20 per cent. for each succeeding year so that it would be doubled by the end of March, 1953. The production target of 14,650 machine tools by 1952-53 was estimated to be almost equivalent to the annual offtake of general purposes machine tools of undivided India (excluding the imports on account of the Defence Department). However, this estimate of the absorptive capacity of the Indian market for machine tools obviously needs to be revised in view of the partition of the country and the difficult days through which the indigenous industry has passed during the last two and a half years. An accurate assessment of demand is made difficult by its extreme sensitiveness to changes in business conditions. Demand is also influenced by the character of the industrial expansion envisaged, *i.e.*, whether it is proposed to develop capital goods industries or consumer goods industries.

The market in India needs a large number of small-size general purpose machine tools required for the development of industry in the thousands of small workshops scattered all over the country. But the greater portion of expenditure is incurred on machine tools covering production, precision and heavy duty machine tools such as capstan and turret lathes, semi-automatics, automatics, heavy milling machines, heavy planing machines, plane-millers, plano-grinders, jig-borers, various types of precision grinders and a wide variety of high speed and heavy duty machines without which it is not possible to step up industrial production. The third market is for certain special purpose machine tools which are always required by the heavy industries such as ordnance factories, railways, shipyards and industries like steel, automobile, aircraft, etc.

With the implementation of the various industrial development and expansion schemes, both in the private as well as the public sector the demand for machine tools may be expected to expand appreciably during the next five years. It is roughly estimated that the value of requirements for indigenous machine tools may be expected to increase to about Rs. 65 lakhs (about 2,170 machine tools) by 1952-53, and nearly Rs. 100 lakhs (about 3,330 machine tools, equivalent roughly to the present total rated capacity) by the end of 1955-56. The demand for modern production, precision and heavy duty machine tools such as those to be produced by the new factory is also expected to increase very appreciably in the near future but it is not possible to arrive at any tentative estimate of the future requirements for such machine tools within reasonable limits of accuracy.

II. Problems of the Industry

(i) *Shrinkage of demand.*—An important problem, as already indicated above, has been the fall in demand for simple and primary types of machine tools during the last two and a half years, which has been largely due to a general slackening of business in the country. As a result, large stocks of machine tools have accumulated with the manufacturers and the carrying of these stocks constitutes not only a serious financial burden on their resources but has also hampered the production activities of the whole industry. However, it is understood that the market demand for machine tools has been showing an appreciable upward trend since the middle of last year, and the stock position is understood to have improved considerably. The outbreak of the Korean War also affected demand favourably. Further, the control over imports of machine tools which

has now been in force for the last two years, has begun to show good results, particularly on the accumulation of large unsold stocks of machine tools imported prior to the tightening of the control. Moreover, so far as possible, the Government have also been assisting the manufacturers by purchasing machine tools from the unsold stocks accumulated with them.

Rationalisation of the indigenous industry is, however, essential so as to eliminate the possibility of over-production of certain types of machine tools and under-production of other types. It is understood that some progress has already been made by the manufacturers in evolving a scheme for rationalisation of the industry.

The manufacturers should also take necessary steps to improve the quality and designs of their products and also to bring down their production costs. This problem is discussed further below.

(ii) *Technical deficiencies, quality and production costs.*—Important problems confronting the industry are the technically defective layouts of most of the factories, the lack of highly specialised technical personnel and the lack of equipment of the latest design Consequently, the quality of the indigenous products is poor, the cost of production is high, the production is confined largely to primary and simple types of machine tools of old designs and the bulk of the products are suitable only for small engineering workshops and not for heavy mechanised industries. Moreover, the quality of machine tools has to be judged not only by their satisfying tests in geometrical accuracy but also by their efficient working and service value. In this connection it is necessary to point out that although machine tools can be manufactured to satisfy standards of geometrical accuracy, their life will be short, their quality will fall short of requirements and their production costs will be high unless proper equipment and raw materials are used in their manufacture. These factors have been responsible for consumers preferring machine tools of foreign manufacture to the corresponding type of indigenous product.

It is understood that three or four manufacturers have recently taken up the manufacture of certain special classes of precision and production type machine tools. For instance Messrs. Mysore Kirloskar are understood to have completed the first few units of their RL type of all-geared head motorised heavy-duty lathes, and Messrs. Cooper Engineering are expected shortly to be turning out a new electrically operated automatic push button type of high speed 24″ shaping machine. Besides, the manufacture of certain improved types of milling and shaping machines, lathes, drills, etc., is expected to be undertaken shortly by some of the indigenous manufacturers. It has not been possible for the indigenous industry to take up the manufacture of such machine tools since their manufacture involves, *inter alia*, highly specialised technical skill and large capital expenditure in the form of jigs, fixtures, patterns, etc. However, with the establishment of the Government factory referred to later, the necessary technical assistance should become available and it should also be possible for the factory to manufacture accurate jigs and fixtures for the private sector of the industry. Moreover, since the Government factory will be undertaking the repair and reconditioning of certain machine tools released from the war reparation's stocks which would be used for the capital construction of the factory, it is hoped that some such machine tools would also be made available to private manufacturers for their development schemes.

(iii) *Raw materials.*—Generally speaking, although the actual cost of the principal raw materials required for the manufacture of machine tools forms a very small portion of the final cost, careful selection of proper raw materials for the work required is extremely

essential. Inadequate supplies or non-availability of certain essential raw materials and semi-finished products from indigenous sources, such as pig iron, scrap iron and mild steel, alloy steel, free machining steel, ball-bearings, carbide tipped tools, etc., has been an important factor impeding the manufacturers' efforts to improve the quality of machine tools and develop the industry. While the manufacture of ball-bearings and grinding wheels is being taken up by the indigenous light engineering industry, Government should encourage the establishment of new factories for the production of other important basic raw materials. If this is not found possible during the period of the Plan, arrangements for adequate imports on planned basis should be made through trade agreements.

III. Programme of Development

(a) *Existing programme.*—At present, there are no major development projects under implementation or under consideration in the private sector. A few leading manufacturers are trying to improve their products and also to undertake the manufacture of certain new models. The State project for the manufacture of machine tools is discussed below.

Government machine tool projects.—In April, 1949, the Government of India entered into a technical assistance agreement with Messrs. Oerlikon Machine Tool Works, Buhree & Co., Zurich (Switzerland) for the establishment of a machine tool factory in India. The firm's technical experts made a detailed survey of the possible sites and recommended Jalahalli and Bhadravati (both in the Mysore State) as the best sites for the location of the factory proper and the foundry respectively, and this was accepted by the Government. Subsequently, detailed estimates for the different stages of the project were worked out by the firm with the assistance of the Government of India but these estimates had to be revised on account of the prevailing financial stringency.

According to the revised scheme the total capital investment on fixed assets is estimated at about Rs. 8·37 crores, spread over a period of four years (about Rs. 8·02 crores for the industrial settlement and about Rs. 0·35 crores for the residential buildings). In addition, working capital to the extent of about Rs. 1·50 crores will be required. Of the total expenditure on fixed assets, it was estimated that about Rs. 2 crores would be required during 1951-52, about Rs. 3·35 crores during 1952-53, and the rest during subsequent years. Messrs. Oerlikons have agreed to take 10 per cent. of the shares of the Company. A preliminary expenditure of about Rs. 14·18 lakhs had already been incurred up to July, 1951. The Swiss firm has agreed to provide the technical 'know-how', equipment, jigs, tools and fixtures, duplicate patterns, operation schedules, etc., and also to loan the services of their technical experts and keymen for a period of 20 years to enable the factory to be established.

The revised scheme envisages the manufacture of 900 high speed lathes, 240 heavy-duty drilling machines and 460 heavy-duty shaping machines per annum and the establishment of a Gear Cutting Shop, a Central Foundry and an Apprentice Training School and Workshop. The annual value of the output when the factory is in full production, *i.e.*, by 1955-56, is estimated at Rs. 4·02 crores. It is, however, proposed to start manufacture in small production series, employing the minimum of equipment and personnel so that the costs of the products will not be higher than the prevailing market prices in the United Kingdom. It is, accordingly, proposed to start first with the manufacture of 400 lathes of $8\frac{1}{2}''$ size per annum. Subsequently production is expected to increase gradually to 1,600 machine tools per annum, by the end of the next five years. Further, although there is a provision for the establishment of a foundry (Rs. 1·40 crores),

it is not intended to undertake its establishment immediately but only at a later stage, if found necessary.

The manufacturing programme of the Government factory which aims at producing 1,600 machine tools per annum, as against the present estimated demand for 1,500 machine tools is considered quite adequate and economical under the prevailing conditions, despite the fact that the present demand may be expected to increase on a moderate scale during the next five years. The volume of production need not strictly conform to the manufacturing programmes, since changes found necessary as a result of actual experience and the prevailing demand for machine tools, can be made in the manufacturing programme during the next few years. Nevertheless, restricted imports of certain special types of machine tools will still be necessary for some years to come.

The Government factory will be engaged in the manufacture of only such machine tools as are primarily used in the railway workshops, ordnance factories and key industries and will not undertake the manufacture of those types and designs of machine tools which are either already being manufactured in the country or which are contemplated to be manufactured by the indigenous industry in the near future. On the other hand, the indigenous manufacturers may expect from Oerlikons all possible technical assistance in improving the quality of machine tools manufactured by them. Thus, the Government factory will actually be complementary and not competitive with the private industry and accordingly, the manufacture of the following types and sizes of machine tools will be left to private enterprise:—

(i) high-speed gear head lathes (7 inches centre, entirely and 8½ inches centre to the extent produced at the end of 1952);

(ii) high-speed shaping machines (20 inches stroke, entirely and 24 inches if produced by the end of 1951);

(iii) high-speed drilling machines (below 1½ inches); and

(iv) universal, horizontal and vertical milling machines, unit milling heads and horizontal boring machines of the types already produced.

The Government do not contemplate manufacturing the above types of machines in the first stage of their programme and have agreed to consult the indigenous industry if their manufacture is to be taken up at any subsequent stage.

The total manpower required for the factory is estimated at about 2,400 workers and 600 officers. Of the 600 officers, 240 would be from Switzerland in the beginning so that they could put the factory into operation, ensure quality production and also train up local officers and labour for attaining the necessary quality and output.

(b) *Recommendations.*—(i) In view of the national and strategic importance of the machine tool industry and the facilities available for its development, the State project to manufacture the modern type of precision and production machine tools suitable for heavy mechanical industries, should be implemented.

(ii) In order to improve the quality and design of the indigenous products, lower their cost of production and extend the range to modern types of machine tools, it is essential for the existing manufacturers to undertake schemes for rationalisation as early as possible. Besides improving the layouts of the factories and securing certain essential equipment, raw

materials and the services of specialised technical personnel, the existing manufacturers should also combine among themselves and set up an extensive sales organisation and an efficient technical sales service. In the meanwhile, the existing manufacturers should also raise their production steadily so as to meet the future estimated demand of a little over 3,000 machine tools by the end of the next five years.

(iii) The Government should help the industry by facilitating adequate and regular supply of the essential raw materials.

The table below indicates the programme of development of the machine tool industry (graded) during the period of the Plan :—

	Unit	1950-51	1955-56
Number of factories	Nos.	14	15
Annual rated capacity	"	3,000	4,600
Actual production	"	1,101*	4,600

*The estimated figure relates to the calendar year 1950.

8. TEXTILE MACHINERY

Cotton textile machinery comprises a wide range of equipment required for the principal operations of the manufacture of cloth from the primary raw material, cotton. It is broadly divided into spinning machinery, weaving machinery and finishing machinery. Each of these broad sections covers machinery for the different unit operations such as opening and mixing room machinery, blow room machinery, carding engines, drawing frames, slubbing frames, intermediate frames, roving frames, and spinning frames in the spinning section of a textile mill. The manufacture of ring frames, plain and automatic looms, carding engines and certain kinds of finishing plants has been established in the last few years and the industry has plans to extend its activities to cover the production of other types of machinery and auxiliaries as outlined later. The sections of the industry producing spinning ring frames and components like spindles, rings, fluted rollers and tin rollers and plain looms are at present protected and the industry also enjoys the benefits accruing from import control which Government had to impose in the last few years from balance of payment considerations.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—The textile machinery industry is less than a decade old though efforts to establish the manufacture of ring frames by the Textile Machinery Corporation Ltd., date back to 1939. Owing to the exigencies of war, the factory and equipment of this pioneering company were taken over by the Government and released only in 1945 so that no benefit could be derived from wartime conditions by this company, which nevertheless, transferred a part of its equipment to Gwalior and formed a separate company, Texmaco (Gwalior) Ltd. for the manufacture of plain looms before the close of the second world war. Recently this firm has started the manufacture of automatic looms also. In the post-war period, a few other companies were started for the manufacture of textile machinery; the principal units in operation or under construction at the time of the inquiry by the Indian Tariff Board in 1949 into the Cotton Textile Machinery Industry were as under:—

Company	Year of registration	Location of factory	Commencement of production
	Ring Frames		
Textool Company Ltd.	1946	Coimbatore, Madras State .	September 1946
National Machinery Manufacturers Ltd.	1947	Kalwe in Thana District, Bombay State.	Not yet commenced manufacture of ring frames.
Textile Machinery Corporation Ltd. .	1939	Belghurriah, West Bengal .	1946
	Carding Engines		
Machinery Manufacturers Corporation Ltd.	1947	Calcutta	April 1951
	Looms		
Texmaco (Gwalior) Ltd. . . .	1943	Gwalior	1943
Mysore Machinery Manufacturers Ltd. .	1947	Bangalore . . .	June 1948

In addition, Ramakrishna Industrials, Coimbatore, were engaged in the manufacture of ring frames, but the machinery was not available for sale being used by the company directly in its associated concerns. There were also certain other engineering concerns like the Cooper Engineering Ltd., Acme Manufacturing Co. Ltd., Achalpur Engineering Works, which were manufacturing ring frames and looms in addition to other products when conditions of demand were favourable.

In June, 1952 the annual rated capacity for the manufacture of ring frames, carding engines and looms and dobbies as declared by the producers was as shown below:—

Machinery	Number of units regularly engaged in manufacture	Annual rated capacity (Numbers)
Ring frames	2	490
Carding engines	1	600
Plain looms and automatic looms	2	7,900
Dobbies	2	1,800

The manufacturers of ring frames as well as certain other engineering firms are engaged in the manufacture of the components of ring frames like fluted rollers, tin rollers, spindles and rings for replacement purposes also. The Tariff Board in its Report of 1951 on the Cotton Textile Machinery (Fluted Rollers and Tin Rollers) Industry estimated the capacity as given below:—

	Number of units engaged in manufacture 1951	Annual installed capacity 1951
Fluted rollers	5	129,400
Tin rollers	3	6,576

Actual production of ring frames, carding engines, plain looms and components like fluted rollers, tin rollers and spindles and rings in the past were as under:—

	1948	1949	1950	1951
Fluted rollers for sale as spares (Numbers)	16,970	27,795	25,007	41,213
Tin rollers for sale as spares (Numbers)	496	1,215	358	560
Spindles for sale as spares (Numbers)	123,733*	33,461*	55,517	100,796
Rings for sale as spares (Numbers)	163,193*	52,105*	114,491	185,650
Ring frames (Numbers)	222	222	259	275
Calico looms (Numbers)	2,392	3,028	1,894	2,260
Carding engines (Numbers)	*Nil*	*Nil*	*Nil*	134

The value of the output of the above textile machinery in 1951 is estimated at about Rs. 1·25 crores. The quality of the machinery produced was discussed at considerable length at both the enquiries of the Tariff Board in 1949 and 1951 and while it was generally agreed that the quality of indigenous equipment was satisfactory, the importance of quality was stressed and it was recommended that it could be improved through more stringent control of the manufacturing operations and wider adoption of testing prior to sale.

(b) *Capital and labour.*—The capital invested in the fixed assets by the six principal manufacturers mentioned above has been estimated at Rs. 3·2 crores in March 1951. During 1951-52 a further investment of Rs. 92·0 lakhs has been made by them bringing the total fixed investment to about Rs. 4·12 crores by April 1952. On this basis it may be taken that the fixed capital investment of the entire industry including the manufacturers of components like fluted rollers and tin rollers and other firms engaged in this line as one of their activities like Acme, Cooper Engineering, etc., would be of the order of Rs. 5·0 crores. Some of the units in the industry have been assisted considerably by the Industrial Finance Corporation in recent years through the advance of loans, and direct financial assistance has been rendered in 1952 to the Machinery Manufacturers' Corporation Ltd. to tide over

*Sales of Texmaco only.

a temporary crisis faced by the firm. The present labour force engaged on textile machinery manufacture is estimated to about 4,000. Most of the workers have been engaged in skilled and semi-skilled operations and the training has been imparted to them by the firms themselves.

(c) *Raw materials.*—The principal raw materials required in the manufacture of ring frames, looms, carding engines, and the components are pig iron, nickel, aluminium ingots, gun metal, M. S. Sections, sheets and plates, bright drawn M. S. sections, M. S. and G. I. wires, tin plates, alloy and special steels and timber. Almost all the raw materials are available in the country except nickel and certain varieties of alloy and special steels which have to be imported. Springs, ball bearings, chains required for frames and temples required for looms are also imported. The cost of raw materials came to about 26·0 per cent. of the fair ex-works price of ring frames in the case of the Textile Machinery Corporation in 1950. In the case of plain looms of 48 in. reed space manufactured by Texmaco in 1950 it came to 47 per cent. The quantities of iron and steel consumed on an average in the manufacture of a complete ring frame, plain loom, carding engine and the important components like fluted roller, tin roller and spindle at the present time are estimated as under:

	Pig iron per unit	Steel per unit	Alloy steel
Complete ring frame	17,920 lbs.	3,741 lbs.	165 lbs.
Plain calico loom	1,909/2,100 lbs.	367 „	..
Carding engines	8,781 „	1,344 „	..
Spindle	3·89 „	0·675 „	0·406 „
Fluted roller	..	..	..

(d) *Imports and exports.*—In the sea-borne trade accounts imports of textile machinery are available under broad categories and in terms of value only so that it is not possible to have an idea of the quantities of different kinds of machinery obtained from abroad. Imports in the last few years were as under:—

	1948-49 (Rs. lakhs)	1949-50 (Rs. lakhs)	1950-51 (Rs. lakhs)	1951-52 (Rs. lakhs)
Spinning machinery	569·4	857·6	391·0	271·7
Weaving machinery	193·4	184·3	78·8	169·5
Bleaching and dyeing machinery	5·4	6·8	6·0	17·1
Printing machinery	9·5	22·9	15·2	26·5
Other machinery	136·4	337·8	245·9	245·6
TOTAL	914·1	1,409·4	736·9	730·4

On the basis of data relating to value of imports and c.i.f. prices, imports of protected categories of textile machinery in 1950-51 and 1951-52 have been estimated as under:—

	1950-51	1951-52
Spinning ring frames (units)	560	500
Plain looms (units)	3,320	8,570
Spindles (Number in lakhs)	4·3	4·3
Spinning rings (Number in lakhs)	2·4	3·5

The import policy relating to textile machinery has been so formulated in recent years as to enable the indigenous manufacturers to step up their production. Plain calico looms are not allowed to be imported whereas imports of other machinery are linked with offtake of a certain quantity of indigenous machinery whose production on a regular basis has been established. As regards exports, very recently attempts were being made to introduce Indian textile machinery in Far East and South American countries. However, this has still to be regarded as at an exploratory stage; it might be possible to export moderate quantities in another two or three years.

(e) *Estimated consumption and requirements.*—Owing to the absence of the requisite break-up of import statistics of textile machinery in terms of the different categories produced in the country, it has been difficult to make a study of the trends of demand in the past. The demand in the post-war years has been to meet the expansion of the textile industry and the need for replacements which had been postponed during war years. The requirements of different categories of textile machinery during the period of the Plan are discussed below.

(i) *Spindles and ring frames.*—During the period of the Plan it is not possible to visualise a rapid expansion of the textile mill industry on account of the shortage of cotton and the fact that production of cotton textiles could be stepped up considerably by a fuller utilisation of existing capacity. Additional capacity in terms of 350,000 spindles has been recommended and this works out to 875 ring frames over the five-year period. In spite of such a modest target for new units, it is envisaged that the demand for ring frames would be quite high considering the large number of uneconomic units in the country and the replacement requirements of several mills in existence. The textile industry being one of our important exporting indutsries, high priority will have to be given to modernisation so that costs of production may be brought down and exports maintained at the high level of 1,000 million yards per annum in the coming years. Reduction in costs is equally necessary for stepping up domestic consumption appreciably. The requirements for replacements and expansion of uneconomic units during the period of the Plan have been placed at 100,000 to 150,000 spindles per annum, so that over the five-year period the demand would come to between 850,000 and 1,100,000 spindles. This would work out at 2,250 to 2,750 ring frames during the quinquennium.

(ii) As regards the demand for looms under the Five-Year Plan for the Cotton Textile Industry, the requirements would be mainly for replacements because it is not considered necessary to add to the loomage already in existence for achieving the production targets for cloth recommended for the mill industry. Additions to loomage might however take place, though no doubt in a small way, for the purpose of balancing uneconomic plants. Further, replacement demand constitutes another outlet. It is necessary for the mill industry to place its orders for looms on indigenous manufacturers so that the capacity in existence might be fully utilised.

(iii) *Carding engines.*—Viewed in the context of the expansion of the textile industry during the period of the Plan and the level of replacement demand, the requirements of carding engines have been placed at 800 to 900 machines per annum.

(iv) *Fluted rollers.*—These are used in ring frames, speed frames and other preparatory machines like drawing frames and comber. The average life of these fluted rollers is estimated as 13 years after which they have to be replaced in the various machines. On the basis of the machinery in existence the Tariff Board, in its Report on the Cotton Textile Machinery (Fluted Rollers and Tin Rollers) Industry (1951) estimated the annual requirements for replacements at 460,000 pieces. In addition fluted rollers would be used

in the production of ring frames and other preparatory machinery whose manufacture is envisaged to be taken up in the future. The total demand is envisaged to go up to 575,000 to 600,000 units in 1955-56.

(v) *Tin rollers.*—On the basis of the total number of tin rollers at work in 1951 in the country which have been estimated at 35,000 sets or 175,000 pieces and assuming an average life of 15 years, the annual replacement demand has been calculated at 11,700 pieces by the Tariff Board. Since it was disclosed at the enquiry by the Tariff Board that the practice of re-use of tin rollers after reconditioning them was fairly widespread in the textile mills, the effective replacement demand was taken by them to be 6,000 pieces per annum.

II. Problems of the Indusrty

The chief problem of the textile machinery industry relates to offtake of the domestic output by the indigenous textile mill industry. Though the quality of the machinery has shown improvement, and the manufacturers are willing to intensify efforts in this direction, there is still a preference for imported machinery. At the low level of production achieved so far, the indigenous units are compelled to distribute the overheads over a small output so that the cost of machinery is high as compared with similar machinery imported into the country. Further, the industry is so organised that it has to produce almost all the components due to absence of ancillary industries whereas the manufacturer of machinery abroad can purchase many parts ready-made for his purpose. Tariff protection and import control have sheltered the indigenous industry from foreign competition. In spite of this, the restrictions on future expansion of the textile industry, particularly the weaving section, have contributed to the difficulties of the industry, by reducing the level of demand.

III. Programme of Development

(a) *Existing programme.*—With the object of making maximum use of the foundry and machining capacity in existence, the manufacturers have plans to manufacture other spinning and weaving machinery. For instance, the Mysore Machinery Manufacturers Ltd. and Texmaco (Gwalior) Ltd. have plans to manufacture preparatory weaving machinery like winding, warping and sizing machines. The Textile Machinery Corporation is executing plans for the manufacture of back process machinery, and drawing frames will soon be manufactured.

The National Machinery Manufacturers Ltd., have achieved by 1st April 1952, installed capacity as under:

(i) Foundry	400 tons of castings per month on single shift.
(ii) Spinning rings (Numbers)	20,000 per month
(iii) Ring spinning spindles (Numbers)	18,000 per month
(iv) Fluted rollers	400 lines per month
(v) Top rollers	50 sets ,,
(vi) Plain cast iron inner tube bearings for ring spindles (Numbers)	10,000 per month

Before 1956 the firm hopes to attain a level of monthly production equivalent to 25 complete ring frames and half the spares mentioned above per month. As a result of the implementation of this programme of the National Machinery Manufacturers, the installed capacity for ring frames would increase to about 800 units per annum.

(b) *Recommendations.*—(i) As already explained, information regarding the exact condition of the textile machinery in the mills, and the magnitude of the problem of renovation is very scanty and therefore the estimates of replacement requirements given earlier have to be re-assessed in detail. Detailed studies of this problem should be undertaken by the Government as early as possible so that the estimates of replacement demand could be forecast with considerable accuracy, and the manufacturing programme properly co-ordinated.

(ii) The industry should be assisted in all possible ways to maintain a high level of production so that, by the end of the period of the Plan, the requirements of spinning ring frames, looms and carding engines and spares like fluted rollers and spinning spindles could be met almost entirely from domestic production. This would assist in bringing down costs of production by a reduction in overhead costs which are comparatively high at present on account of the low level of production.

(iii) The manufacturers should concentrate on improving the quality of machinery and components through regular inspection and control over the various stages of production, and also make efforts to reduce material losses in process operations. This would ensure a favourable market in the country as well as abroad.

(iv) Import control should be continued during the period of the Plan and the quantum of imports adjusted, having regard to the levels of production achieved by the industry in previous years and the expansions that have been effected.

The following table summarises the programme of development of the principal sections of the textile machinery industry during the period of the Plan:—

	1950-51		1955-56	
	Rated capacity	Actual production*	Rated capacity	Actual production
(i) Spinning ring frames	396	260	800	700
(ii) Plain, semi-automatic and automatic looms	3,600	1,894	8,000	6,000
(iii) Carding engines	600	*Nil*	600	600

*Calendar year 1950.

9. BALL AND ROLLER BEARINGS

Ball and Roller Bearings are required for the products of a number of engineering and electrical industries, light as well as heavy, such as pumps, machine tools, tractors, plummer blocks, textile machinery, tanks, aircraft and also electric fans, motors, *etc.* The ball and roller bearing industry, therefore, is of basic and strategic importance and with the growth and development of industries in the country, the demand for its products is expected to increase appreciably. Till very recently, however, the country was entirely dependent upon imports and it was only about three years back that a factory was planned to be established at Jaipur; it actually went into production in August, 1950.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—Messrs. National Bearing Co. Ltd., established at Jaipur in technical collaboration with Messrs. Hoffmann Co. Ltd., of the United Kingdom in 1949, is at present the only firm in the country engaged in the manufacture of ball bearings. The present rated capacity of the firm, on an 8-hour single shift basis, is 600,000 complete bearings. It is, however, understood that the capacity can be doubled, if worked on a multiple shift basis. The present manufacturing activity of the existing unit is confined mostly to ball bearings of sizes upto 2" diameter bore.

The firm started commercial production of complete bearings only in August, 1950, and the total output before the end of the year was 40,822 complete bearings. The approximate value of the production in 1950, was Rs. 2·04 lakhs, taking Rs. 5 as the average value per bearing. The actual production during 1951, was 234,500 complete bearings, and the highest monthly average production achieved by the firm was in December, 1951, when the production went up to 32,435 complete bearings on partial one shift basis.

(b) *Capital and labour.*—The total paid-up capital of the firm is estimated at Rs. 40 lakhs, excluding Rs. 30 lakhs assured by way of loans. The total number of persons employed by the firm is estimated at about 530.

(c) *Raw materials.*—The National Bearing Co. manufacture ball bearings to the standards laid down by the Hoffmann Manufacturing Co. Ltd., and their requirements of raw materials are therefore governed by the specifications laid down by the latter. The most important raw material used in their ball bearings and steel balls is H.C.I. (high carbon chromium steel) bars and wire. The chemical composition and physical properties of this steel have to be within very close limits.

(i) *Ferrous materials.*—H. C. I. Steel, mostly bars, for manufacture of inner and outer races, H. C. I. steel wire for manufacture of balls, mild steel rivets, mild steel nuts and mild steel locking plates for U. T. Bearings and mild steel tubes for sleeves for U. T. Bearings. The quantity of H. C. I. bars and wire and mild steel required for their full capacity of 600,000 bearings per annum is approximately (a) steel bars 227 tons (worth about Rs. 3·79 lakhs), (b) tubes 86 tons (Rs. 0·95 lakhs), (c) rings 80 tons (Rs. 2·49 lakhs) and (d) steel wire 175 tons (Rs. 2·93 lakhs).

(ii) Non-ferrous materials required for the manufacture of bearings are brass strips for cages for small bearings and brass tubes or brass rods for cages for large bearings. For the existing annual rated capacity of 600,000 complete

bearings, the quantities of brass tubes, bars and strips required are estimated at about 13 tons (valued at about Rs. 0·37 lakhs), 48 tons (Rs. 1·19 lakhs) and 17 tons (Rs. 0·45 lakhs) respectively.

The Jaipur factory imported its entire requirements of H. C. I. steel from the United Kingdom when it started production and has recently been importing from Germany also. Brass strips and finished solid cages were also imported from the U. K. in the beginning. After the outbreak of the Korean War, there were difficulties in securing adequate supplies of these materials. The firm, therefore, took steps to develop the manufacture of these materials in the country. Brass strips of the requisite quality are now produced by Messrs. Kamani Metals & Alloys Ltd., Bombay, and H. C. I. bars by Bhartia Electric Steel Co. Ltd., Calcutta and Mukund Iron & Steel Works Ltd., Bombay. The indigenous H. C. I. steel has been found to be of the correct chemical composition, but it is not free from rolling defects. It is also deficient so far as dimensions and hardness are concerned. The National Bearing Co. have, therefore, arranged to instal an annealing furnace and skinning machine for the bars and a wire drawing bench with special annealing equipment for the wire. With the aid of this equipment they will be able to obtain bars and wires to the required specifications from the steel supplied by indigenous producers and thus become independent of imports. Forged H. C. I. rings which are used for large size bearings are imported, though the firm is endeavouring to develop production in the country. M. S. tubes have to be imported, while brass rods, strips and tubes, mild steel for rivets, sleeves and nuts are obtainable from indigenous sources.

(d) *Imports and exports.*—Figures relating to the imports of ball and rolling bearings are not recorded separately in India's Sea-borne Trade Accounts. According to the data supplied to the Tariff Commission, the imports of ball bearings came to 1.078,790 pieces in 1950 and 488,461 pieces in 1950. At present, the volume of imports into the country is restricted and this is expected to provide a good measure of protection to indigenous manufacture.

(e) *Estimated consumption and requirements.*—The demand for ball bearings is, broadly speaking, composed of (a) demand for bearings as original equipment of machinery and (b) demand for replacement. In India, the demand for ball bearings as original equipment comes mainly from the following industries: electric fans, electric motors, power-driven pumps, flour mills, chaff cutters, machine tools and textile and sugar machinery. No exact estimate of the total demand for ball bearings in India is available, but it has been possible to build up an estimate on the basis of the information furnished to the Commission by different consuming industries, the National Bearing Co. which is the only manufacturing firm and the importers. This information was verified at the public inquiry into this industry held by the Tariff Commission on 5th, 6th and 7th May, 1952.

A large part of the total demand for ball bearings in India is accounted for by the electric fan industry; the annual requirements of this industry including replacements have been estimated at 600,000 bearings. The total annual demand of the electric motors industry for ball bearings is estimated at 50,000 and of power-driven pumps at 90,000. The demand of the flour milling industry has been estimated at 50,000 bearings per annum and that of the machine tool industry at 3,000 bearings. The textile machinery industry (ring frames) accounts for an estimated demand of 1,900 ball bearings and the sugar machinery industry for another 500 bearings. These estimates add up to a total of a little less than 800,000 bearings. This figure does not, however, include the demands for bearings of certain other industries such as the chaff cutter, automobile and heavy machinery industries.

Taking these into account, the estimated demand for ball bearings may be placed at about 900,000. It may be mentioned in this connection that the actual imports of ball bearings into India by the six main importers, namely, S. K. F. Ball Bearing Co., Bombay, Roberts McLean & Co., Calcutta ; Guest Keen, Williams, Calcutta ; National Bearing Co., Calcutta ; Bombay Company, Calcutta ; and General Motors of India, Bombay, were according to the figures furnished by them, 1,078,790 in 1950. An estimate of about 900,000 bearings as representing the annual demand would, therefore, appear to be correct. It may be noted that this estimate excludes roller and taper roller bearings which were not included within the scope of the Commission's inquiry. It also excludes Japanese bearings for which no reliable information is available at present.

The ball bearings which are used by different industries are not only of different sizes but also of different specifications or series. It has not been possible to ascertain at present the demand for each individual specification or series or even for individual sizes of bearings. It is, however, possible to indicate an approximate total demand for bearings within different ranges of sizes and also to state the range within which the demand from different industries lies. The demand for bearings below 3/8″ bore diameter or 10 m.m. is estimated at 25,000 to 30,000; for those between 3/8″ bore diameter to 1″ bore diameter (10 m.m. to 25 m.m.) at 550,000 to 600,000; for those between 1″ bore diameter and 2″ bore diameter (25 m.m. to 50 m.m.) at 200,000 and for those above 2″ bore diameter (above 50 m.m.) at about 75,000. The electric fan industry uses bearings of sizes ranging between 3/8″ bore diameter and 1″ bore diameter, though sizes below 3/8″ bore diameter are also used. Other industries producing electric meters, power-driven pumps, chaff cutting machinery, flour mills, machine tools, sugar mill machinery use bearings of sizes above 1″ bore diameter and upto 2″ bore diameter. Ball bearings of sizes above 2″ bore diameter are required mostly for heavy machinery. The automobile industry uses a variety of ball bearings of special types.

As against present requirements estimated at about 900,000 bearings, it is visualised that the consumption in 1955-56 would be of the order of 1·2 to 1·3 million bearings.

II. Problems of the Industry

A fall in the demand in the country for indigenous ball bearings and difficulties in securing an adequate supply of the necessary raw materials from foreign markets are the main problems of the existing manufacturer at present. It is understood that the effects of heavy imports during the period when bearings were put under the Open General Licences, are still being felt by the Jaipur factory. The industry's case for protection is now pending before the Tariff Commission and it is expected that this aspect would also be examined. As already stated earlier the firm is gradually getting over the difficulties of obtaining raw materials and it is expected that they will soon be independent of imports for all the important raw materials.

III. Programme of Development

(a) *Creation of additional capacity.*—The present rated capacity of the existing unit. assessed at 600,000 pieces per annum on a single shift basis, is obviously far from adequate to meet the future estimated demand. However, account should be taken of the fact that while the manufacture of bearings is a highly complex undertaking requiring specialised equipment, toolings, etc., and highly skilled labour, the existing unit went into production only about two years back and has been experiencing certain difficulties in

raising the output. Moreover, it is understood that their present rated capacity is capable of being doubled on a multiple shift basis and also that the firm has in view the expansion of their works, if necessary. It is, therefore, recommended that the existing company should be encouraged to utilise their full potential capacity and to raise production, and the question of increasing the capacity by establishing a new unit should be reviewed in the light of the progress made by the existing unit within the next 2-3 years.

(b) *Recommendations.*—(i) Imports of ball bearings should continue to be carefully watched and restricted, so as to avoid a glut in the market.

(ii) The efforts now being made to manufacture special ball bearing steel within the country should be encouraged by the Government by suitable incentives. In the meanwhile, the indigenous manufacturer of bearings should be assisted by facilitating the import of the necessary raw materials.

The following table summarises the development programme for the ball and roller bearing industry during the period of the Plan :—

	1950-51	1955-56
1. Number of units	1	1
2. Rated capacity (Numbers)	600,000	1,200,000
3. Actual production (Numbers)	86,568	1,200,000
4. Consumption (estimated quantity available) and demand (Numbers)	900,000	1,200,000
5. Capital investment (Rs. '000)	(*a*) 70,000	*N.A.*

(*a*) Including Rs. 30 lakhs, secured as loans
N.A.—Not avai able

10. BICYCLES

Bicycles provide a cheap and speedy means of conveyance and transport to large masses in the country both in the urban as well as the rural areas. Besides, cycles of special construction and design are also used to some extent for purposes of carrying goods by grocers, bakers, milkmen, newspaper vendors, etc. In a country like India, where conveyance and transport facilities are limited and inadequate, bicycles play an important role in the country's economy, as indicated by the expansion of requirements during the last decade.

I. Brief Survey of the Industry

The total number of pedal bicycles in use in India was recently estimated at about 1,500,000, which worked out approximately to 3·85 bicycles per thousand of the population. The corresponding figures for a few other countries were: about 74 bicycles per thousand in the United States: 255 in the United Kingdom and as much as 539 in Denmark. Although it had long been felt that the woefully inadequate number of bicycles in this country and its dependence on imports should be tackled by having a national industry, no attempt was made to develop a bicycle industry in the country till 1938, and it was only during the subsequent year that two factories were established. Since then, several units have sprung up in the country for the manufacture of bicycle parts and accessories. At present, there are about 24 of them engaged in the manufacture of parts and accessories in an organised manner. In addition, five firms were given permission by the Government in the post-war period to manufacture and assemble complete bicycles.

(a) *Location, rated capacity and production.*—Messrs. Hind Cycles Ltd., Bombay, with a rated capacity of 100,000 bicycles per annum on the basis of a 8-hour single shift and 300 working days, and Messrs. Hindustan Bicycle Manufacturing & Industrial Corporation, Patna, with an annual rated capacity of 20,000 bicycles, both established in 1939, are the only two companies at present manufacturing complete bicycles with the exception of chains, freewheels, spokes, nipples, lugs, saddles and certain other accessories. Messrs. Hind Cycles Ltd., have a target of production of 150,000 bicycles in 1952 by working more than one shift. The firm could not achieve the production target last year due to labour trouble and it remains to be seen whether they will achieve it this year. Assistance by way of the supply of adequate raw materials for the contemplated target has been fully given. While the production of these units is mainly confined to the manufacture of Roadster Models, other types of bicycles such as Lady's, Racing and Boys' Models are also manufactured to some extent, but Tandem and carrier types of cycles are not manufactured at all. Of about 150 parts and accessories which go to make a complete bicycle, the two existing units manufacture almost all the parts and accessories except the items, mentioned above which have to be imported. The manufacture of these parts is, however, expected to be taken up shortly by the existing manufacturers as well as by new units.

The industry for manufacturing cycle parts made remarkable progress during the war, which has been continued in the post-war period. The indigenous production of cycle parts has expanded steadily and the value of output rose from about Rs. 18 lakhs in 1949 to about Rs. 65 lakhs in 1950 and to about Rs. 89 lakhs in 1951.

The total annual rated capacity of the indigenous bicycle manufacturers which was about 94,000 bicycles during 1948-49 had increased to about 120,000 bicycles (on a single shift basis) during 1950-51. The actual production though considerably below the rated capacity has also increased appreciably during the last three years. The total production of bicycles, spare parts and accessories expressed in terms of complete bicycles, increased from about 70,530 bicycles in 1948-49 to 91,500 in 1949-50. The production of complete bicycles by the two manufacturers alone was as high as 101,136 bicycles in 1950-51 and 120,288 bicycles in 1951-52.

Three out of the five units who were given permission by the Government to manufacture bicycles in progressive stages have started production. These firms are manufacturing only a few parts but are assembling complete bicycles with the aid of imported parts not manufactured by them.

(b) *Capital and labour.*—The total paid-up capital of the two manufacturing units amounted to more than Rs. 37 lakhs in 1950-51, and the total number of persons employed by them was about 1,570. According to the Census of Manufactures, the total fixed capital of the entire bicycle industry was about Rs. 61 lakhs in 1950, while the total number of workers employed was about 3,000.

(c) *Raw materials.*—The raw materials required by the bicycle industry may be considered under the following heads:—

(i) *Basic raw materials.*—While steel is the basic raw material, the different types of steel required are: bright steel strips and bars; electrically welded steel tubes; mild steel bars free cutting quality, sheets, wires and spring wire. Except for mild steel which is available from indigenous sources, most of the other basic raw materials including electrically welded tubes, bright steel, bars and strips have to be imported, mostly from the United Kingdom, U. S. A., Germany and Belgium. The total quantity of mild steel required, on the basis of the present annual rated capacity of the two organised units, *viz.*, 120,000 bicycles on a single shift basis, is estimated at 1,682 tons (valued at about Rs. 5·89 lakhs), while about 516 tons of electrically welded steel tubes (Rs. 6 lakhs) and about 617 tons of steel strips (Rs. 4·4 lakhs) have to be imported annually.

(ii) *Ready components.*—Ready components like freewheels, spokes, saddles, nipples, lugs, chains are essential which are being imported by the indigenous manufacturers. However, the manufacture of a few of these ready components such as chains, saddles and also freewheels has been taken up in the country.

(iii) *Rubber parts.*—A number of rubber parts, such as tyres, tubes, handle grips, pedal rubbers and brake rubbers are required, and all these parts are available from indigenous manufacturers.

(iv) *Other raw materials: consumable stores.*—The consumable stores required are high speed steel, die steel, nickel, chromium and copper anodes, bronze wire, colouring, brazing and electroplating materials, belts, emery powder, grinding wheels, fuel and fuel oils. The bulk of these consumable stores is available from indigenous sources.

(v) *Accessories.*—Accessories like lamps, carriers, stands, bells, pumps, tool bags and reflectors are manufactured in India.

(d) *Imports and exports.*—The rated capacity of the indigenous industry being inadequate to meet the country's total requirements, a large number of complete cycles were imported in the past. In addition to this, the country is importing a variety of cycle parts not only to cater to the needs of all the manufacturers but also for replacement

purposes. The total imports of complete cycles into India which amounted to 264,392 (valued at about Rs. 2·48 crores) during 1948-49 and 268,148 (Rs. 2·52 crores) during 1949-50 went down to 165,461 (Rs. 1·46 crores) during 1950-51 and increased again to 283,100 (Rs. 2·83 crores) in 1951-52. Similarly, the imports of cycle parts and accessories, valued at about Rs. 1·51 crores during 1948-49 and Rs. 1·59 crores during 1949-50, went down to Rs. 0·96 crores during 1950-51 and increased to Rs. 1·44 crores in 1951-52. At present, the imports of bicycles and cycle parts are regulated on the basis of the anticipated consumption and the potential and actual output of cycles and parts in the country.

Exports of cycles, if any, are negligible.

(e) *Estimated consumption and requirements.*—According to the Indian Tariff Board (Report of the Bicycle Industry, 1949) the demand for bicycles in the Indian Union was estimated at 350,000 in 1949-50, 375,000 in 1950-51 and 400,000 in 1951-52. As against these estimates, the total quantity available for consumption represented by imports and indigenous production, was 360,000 during 1949-50 and 264,000 during the subsequent year. The demand for bicycles, however, should not be regarded as a static factor as it is largely dependent upon price as well as quality. Thus, while it is difficult to make an accurate forecast of the future demand, it may be estimated to go up to about 375,000 by 1952-53, and about 500,000 by 1955-56, at the current level of prices.

II. Problems of the Industry

At present, the manufacturers are experiencing difficulties in obtaining supplies of imported raw materials. Occasional difficulties are also encountered by manufacturers in the procurement of indigenous steel. Every attempt is being made to ensure, so far as practicable, that the industry does not suffer a set-back in production, as a result of these factors.

III. Programme of Development

(a) *Existing programme.*—As a result of the implementation of the expansion and development schemes, mentioned below, the capacity of the industry is expected to increase to 430,000 by 1952-53 and 530,000 by 1955-56.

Messrs. Hind Cycles have recently embarked on an expansion project and have ordered new machinery not only to rationalise the production methods but also to expand the capacity by relieving bottlenecks of production. They have also ordered out machinery for the manufacture of freewheels, for which there is no organised capacity in the country at present. It is difficult at this stage to predict what will be their ultimate capacity on a one shift basis when all the machines have been installed.

Development schemes of three new firms, namely, Messrs. Sen-Raleigh Industries of India at Asansol, Messrs. T. I. Cycles of India at Ambattur near Madras and Messrs. Atlas Cycle Industries at Sonepat, Punjab, for the manufacture of complete bicycles, have been approved by Government and are now under implementation. These three new units, each with a capacity of 100,000 bicycles per year were expected to go into production in 1952 and the last two started commercial production in June 1952. The total paid-up capital of the three new units is at present estimated at about Rs. 1·25 crores. Messrs. India Cycle Manufacturing Co. who are the largest manufacturers of bicycle parts are also assembling bicycles partly with parts manufactured by them and partly by imports of certain components. Their capacity is 10,000 bicycles annually. Thus, the total capacity for the bicycle industry is likely to be 430,000 bicycles in the year 1952-53. The

actual production is, however, expected to be below the capacity as the four new units have gone into production only recently.

(b) *Projects yet to be implemented.*—Besides, Messrs. Wearwell Cycle Industries propose to manufacture 100,000 bicycles per annum and, recently, they have received sanction for a capital issue of Rs. 25 lakhs for putting up their factory. With the implementation of this new scheme the total rated capacity of the bicycle industry is expected to increase from 430,000 in 1952-53 to 530,000 bicycles per annum by 1955-56 based on single shift working. The actual production is not expected to exceed this figure.

Further, Messrs. Pioneer Cycle Co., Messrs. Popular Cycle Manufacturing Co., and Messrs. Precious Die Works have plans for the manufacture of a variety of cycle parts.

(c) *Recommendations.*—(i) The demand for bicycles, as stated earlier, is closely dependent upon their price and quality, and planning in the case of such an industry has, therefore, to be on a scale which is appreciably higher than the anticipated demand. It is expected that the potential capacity of the industry by 1955-56, which would be higher than the anticipated demand, would help in lowering prices, improving quality and, thus, also help in improving the demand. Moreover, with an appreciable fall in price and an improvement in quality, there should be good prospects for the export of about 50,000 Indian bicycles to some of the neighbouring countries. However, no further addition to the industry's capacity should be contemplated during the next five years over and above the expansion and development projects already mentioned.

(ii) Standards for the different components and parts, which go to make a complete bicycle, are being formulated by the Indian Standards Institution and are expected to be published shortly. In the meanwhile, the new manufacturers should give preference to the manufacture of the different standardised components over projects for future expansion of assembling capacity, so as to lead to a progressive reduction of imports of the component and, as far as possible, to complete self-sufficiency by 1955-56.

(iii) The small-scale manufacturers of cycle parts and other accessories, if properly organised and supplied with the necessary raw materials and technical supervision, are capable of being developed into an important branch of the main bicycle industry. There is need for a close co-ordination between the small-scale manufacturers of cycle parts and the large manufacturers of complete bicycles and it is to be expected that the latter will help to facilitate the growth and development of such small-scale manufacturers in different parts of the country.

(iv) The present capacity in existence within the country for the manufacture of tubes and bright bars should be utilised as much as possible. But this again, is governed by the availability of steel strips for tubes and free cutting bars for manufacture of bright bars.

The following table summarises the development programme for the bicycle industry during the period of the Plan:—

	1950-51	1955-56
1. Number of units (manufacturing only)	2	7
2. Rated capacity (numbers)	120,000	530,000
3. Actual production (numbers)	101,136	530,000
4. Consumption (quantity available for consumption)	266,597	500,000*

*Excluding the export of about 30,000 bicycles

11. SEWING MACHINES

The sewing machine is an important domestic as well as industrial appliance. Generally speaking, an ordinary domestic type of sewing machine which is used for stitching light clothing is an important household necessity for a middle class family in this country. Besides, sewing machines of special designs are reqiured for tailoring and for making garments on a large scale and for certain other industrial purposes such as the stitching of heavy clothing, leather, hosiery, canvas tarpaulins and a variety of other things in which sewing or stitching is necessary. Moreover, since a plant for the manufacture of sewing machines can also be converted for the production of a number of precision instruments required for defence and military purposes, the sewing machine industry has considerable national importance.

I. Brief Survey of the Industry

Before the last war, the country was largely dependent upon imports as there were only two units for the manufacture of sewing machines, one of which was registered in 1936 and the other in 1938. At the outbreak of the last war, however, these units had to switch a major portion of their productive capacity on to the manufacture of munitions, such as, halden apparatus, pressure gauges, vapourising tubes, aircraft components and various other precision stores. Consequently, the development of the manufacture of sewing machines was held up during the war years, although certain plants and machine tools for the sewing machine industry were imported in 1943. Since the end of the war, however, both the units have been concentrating again on the manufacture of sewing machines while one of them has been organising its factory on mass production lines.

(a) *Location, rated capacity and production.*—At present, there are only two manufacturers in the country of the domestic type of sewing machine; they are Messrs. Jay Engineering Works Ltd., Calcutta (the trade name of their machines being "Usha") with an annual rated capacity assessed in 1951 at 36,000 machines (hand and treadle) on the basis of a 8-hour single shift and 300 working days, and Messrs. K. C. Mullick and Sons, Calcutta (the trade name of their machines being "Mullick"), with a capacity of about 1,500 machines (treadle) per annum. Both the units are manufacturing all parts and components of the sewing machine except needles. It is understood that the rated capacity of the former unit is to be raised to 40,000 machines per annum, during 1952-53. The firm has also started the production of industrial sewing machines equivalent to Singer's 35-K-15 model, suitable for the stitching of leather, canvas and heavy clothing. Besides the production of domestic and industrial sewing machines, the firm is also engaged in the manufacture of hurricane lanterns, enamels and paints, cooking ranges, electric fans and certain other mechanical appliances.

According to the Census of Manufactures, there were 4 units engaged in the manufacture of parts of sewing machines in 1950, in addition to the 2 manufacturers of complete sewing machines.

The total rated capacity of the indigenous industry increased from about 12,000 sewing machines per annum in 1947 to about 24,500 in 1948-49 and 28,500 in 1949-50. In 1950-51, the annual capacity increased further to 37,500 machines. There has also been a steady increase in the actual output of the industry. The actual production which was 21,864

machines during 1948-49, increased to 26,473 machines during 1949-50, to 32,965 machines during 1950-51 and in 1951-52 reached a figure of 48,116 machines.

(b) *Capital and labour.*—While the total paid-up capital of the two existing manufacturers is a little over Rs. 19·23 lakhs, the productive capital employed in the industry is estimated at about Rs. 1,00 lakhs. The total number of persons employed in the two units is estimated at 1,780. In 1950, according to the Census of Manufactures, the total fixed capital of the entire industry, including the manufacturers of parts, was about Rs. 47 lakhs, and the total number of persons employed was about 2,000.

(c) *Raw materials.*—The raw materials required for the manufacture of sewing machines are as follows:—

1. Pig iron.
2. Steel of different kinds, such as—
   - (i) mild steel black sheets,
   - (ii) mild steel bars and wires,
   - (iii) carbon steel rods,
   - (iv) mild steel bright sheets and rolled flat,
   - (v) mild steel deep drawing sheets,
   - (vi) silver steel rods,
   - (vii) spring steel strip coils and wires, and
   - (viii) piano forte wire.
3. Teak wood and plywood.
4. Painting and plating materials, such as stoving enamel, lacquers, thinners, transfers and copper and nickel anodes.
5. Rubber rings and leather belts (for treadle machines only).
6. Abrasive paper and cloth.
7. Accessories, such as oil bottles and cans, needles and metal accessory boxes.

A sewing machine factory is expected to have a foundry of its own for the manufacture of castings. Of the eight different kinds of steel mentioned above, the first three are available in the country, while the remaining five have to be imported. Rubber rings are available in the country but leather belts have to be imported. About 50 per cent. of the requirements of black enamel and 70 per cent. of the requirements of abrasive paper and cloth are obtained from indigenous sources, while the rest has to be imported. The quantities of certain indigenous and imported raw materials and components required for the capacity in 1951 of 37,500 sewing machines per annum is indicated below:—

Material	Quantity (Tons)	Value (Rs. '000)
1. Pig iron	2,109	2,53
2. Steel	78	27
3. Steel, free cutting and strips	217	1,74
4. Steel balls	4,296 (Gross)	4
5. Needles	1,500 ,,	30
6. Painting and electroplating material	..	98

A sewing machine is an assembly of a number of parts machined out of iron castings, steel forgings and steel sections. A very high degree of precision is required in the finishing of all internal and external dimensions in order to ensure smooth running and interchangeability of parts.

(d) *Imports and exports.*—Up till 1936 the country was almost entirely dependent upon imports of sewing machines, and during the subsequent years also large quantities were imported. During 1937-38, for instance, 90,023 sewing machines were imported into undivided India, and 61,231 during 1938-39. However, there has been a steady decline in imports since the establishment of indigenous production, especially since the end of the last war. Imports of sewing machines have declined from 56,074 (valued at Rs. 1,10 lakhs) during 1948-49 to 48,693 (Rs. 1,03 lakhs) during 1949-50, and 23,426 (Rs. 64 lakhs) during 1950-51. They increased to 31,797 machines during 1951-52.

During the last few years, India has also established export markets for sewing machines in a number of neighbouring countries, including Burma, Malaya, East Africa, Singapore, Philippines, South America, Australia, Egypt, Iran, Iraq, etc. Since 1947, export of sewing machines of Indian manufacture has been allowed freely without any licence. The exports are, however, not recorded separately. According to the Tariff Board's Report (1949), about 1,000 machines were exported during 1948-49. The volume of exports is estimated to rise to about 12,000 machines per annum during the period of the Plan.

(e) *Estimated consumption and requirements.*—The total quantity of sewing machines of the domestic type available for consumption during 1950-51 as represented by the sum of indigenous output (32,965) and imports (23,426), but excluding the exports (approximately 3,000), was about 53,390 machines. On the other hand, the internal demand for such sewing machines during 1950-51 was estimated by the Tariff Board (1949) at about 51,000 machines. It is expected that the demand would increase to 54,000 by 1951-52, and to as much as 80,000 machines by 1955-56.

The demand for industrial sewing machines in 1950-51 was estimated by the Tariff Board at about 34,000 machines.

At present, the bulk of the demand for such machines is met by imports. The demand for industrial sewing machines is estimated to increase to about 36,000 by 1951-52 and about 44,000 per annum by the end of 1955-56.

II. Problems of the Industry

The main problem confronting the industry at present is that of securing an adequate supply of suitable types of steel. It is understood that Messrs. Jay Engineering Works have recently made arrangements for the import of special steel from the manufacturers in Belgium and Germany.

III. Programme of Development

(a) *Existing programme.*—Messrs. Jay Engineering Works have recently modernised their factory and expect to be able to raise their production to about 5,500 machines per month before the end of 1952 by working more than one shift. Moreover, they hope to expand their capacity further to 90,000 machines per annum before the end of 1954. The firm is expected to invest about Rs. 60·0 lakhs during the period of the Plan. Thus, by 1955-56, while the total rated capacity of the existing manufacturers is expected to increase to about 91,500 machines per annum, the internal demand is estimated to expand to about

80,000 machines and the exports to about 12,000 machines per annum. In view of the anticipated increase in the total rated capacity of the indigenous industry, any scheme for the establishment of a new unit should be considered only after 1954, in the light of the progress made by the existing manufacturers by then. Any further expansion of the industry visualised on the basis of review at that time should accord special importance to the production of industrial machines.

With regard to industrial sewing machines, Messrs. Jay Engineering Works, as stated earlier, have already started the production of machines equivalent to Singer's 35-K-15 model. They expect to produce 3,000 such machines during 1952 and propose to expand their production to about 20,000 machines per annum by 1955-56. The demand for such machines, on the other hand, is estimated to increase to about 36,000 by 1951-52 and to 44,000 by 1955-56. Of the total estimated demand, however, about 20,000 to 24,000 machines are of very special type and it would be more economical to obtain such machines from expert foreign manufacturers for some years to come rather than to take up their production within the country. Further, it may also be mentioned that a new model of industrial sewing machine, suitable for high speed stitching and used in garment factories, is being developed in the Jay Engineering Works and they expect to commence its production by the end of 1952.

(b) *Recommendations.*—(i) Any scheme for the establishment of a new unit for the manufacture of sewing machines of the domestic type should be considered only after 1954, in the light of the progress made by the industry.

(ii) The existing manufacturers should continue their efforts to improve the quality of their products so as to attain the standard of the imported machines as early as possible.

(iii) While the development of industrial sewing machines within the country should be encouraged, machines of special types should continue to be imported as a short-term policy.

The following table summarises the programme of development for the sewing machine industry during the period of the Plan:—

	1950-51	1955-56
1. Number of units	2	2
2. Rated capacity (numbers)	37,500	91,500
3. Actual production (numbers)	32,965	91,500
4. *Consumption* (numbers available for consumption)	(*a*)53,390	(*b*)80,000

(*a*) Excluding exports of about 3,000 machines.
(*b*) Excluding exports of about 11,500 machines.

12. HURRICANE LANTERNS

Hurricane lanterns form an essential article of every day use in rural areas. The completion of various power projects would increase the supply of electricity to a great extent but complete electrification of rural areas can be visualised only as a long-term measure. Hence hurricane lanterns will continue to be a necessity in the coming years particularly in smaller urban centres and villages. The indigenous lantern industry has shown considerable progress and at present it is able to meet the entire needs of the country. Its further development will make possible the export of lanterns to neighbouring countries.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There are at present 12 major units engaged in the production of hurricane lanterns. On the basis of single shift operation of the units for 8 hours per day and 300 working days per annum the capacity of the entire industry is estimated at 4·4 million lanterns. The industry is mainly located in West Bengal which accounts for about 61 per cent. of the installed capacity distributed between five firms.

The production of hurricane lanterns in 1948-49 and 1949-50 was only 1·2 million and 1·8 million respectively, whereas in 1950-51 it amounted to 3·2 million which is about 76 per cent. of the rated capacity. The production in 1951-52 was 3·9 million lanterns.

(b) *Capital and labour.*—The capital invested in the industry is estimated at Rs. 50·0 lakhs including investment for the manufacture of certain other products as well. The entire industry provides employment to about 3,000 persons at the present time.

(c) *Raw materials.*—The principal raw materials required by the industry are tin plates, steel wire and brass sheets. For the production of about 4·4 million lanterns the requirements of tin plates and steel wire has been estimated at 3,503 tons and 197 tons respectively. The requirements of brass sheets are relatively small, being of the order of 14 tons.

(d) *Imports and exports.*—The total number of lanterns imported into the country in 1950-51 amounted to only 500,000 valued at Rs. 27·52 lakhs whereas in the previous years 1949-50 and 1948-49 the imports were 1·2 million valued at Rs. 52·12 lakhs and 590,000 valued at Rs. 23·1 lakhs respectively. Imports in 1951-52 went down to 230,000 lanterns valued at Rs. 28·64 lakhs. These figures include imports of all other metal lamps also. Exports of lanterns are negligible at present.

(e) *Estimated consumption and requirements.*—The present annual demand for hurricane lanterns is estimated to be 3 to 4 million and this domestic demand is expected to increase to 5 million by the end of the period of the Plan. Further, if suitable facilities are provided, it should be possible to export about 1 million lanterns per annum to countries in South East Asia. It is, therefore, desirable to step up production to 6 million lanterns by 1955-56.

For the production of 6 million lanterns the requirements of tin plate, steel wire and brass sheets would be 4,766 tons, 268 tons and 18 tons respectively.

II. Problems of the Industry

(i) Manufacturers are experiencing difficulties in procuring tin plate, wire and tin ingots, the essential raw materials of the industry. The good finish obtained by using tin

plate would improve the quality of lanterns and increase demand in foreign markets. Hence tin plate and other raw materials should be made available to meet the entire requirements of the industry.

(ii) Some difficulties are being experienced in marketing Indian lanterns in foreign countries including Pakistan on account of their comparatively high price and in recent months on account of competition from Japan. The industry has to bring down the cost of production so far as possible so that the targets of export may be achieved.

III. Programme of Development

(a) *Existing programme.*—The following are the schemes which are expected to come into operation during the period of the Plan.

1. Messrs. Hindustan Lantern Factory is being established at Saharanpur with a capacity of 100,000 lanterns per annum.
2. Messrs. Bhagat Singh Bugga and Co. (now known as Mass Products Ltd.), Lucknow, have imported a plant from Japan for the manufacture of 150,000 lanterns per annum. This factory has gone into production in April 1952.

(b) *Recommendations.*—(i) Further expansion of the industry after the implementation of the existing programme is not necessary till the end of the period of the Plan as the capacity would be sufficient for meeting the requirements of the domestic market and exports, if the units work on more than one shift per day.

(ii) The Industry should standardise the production of lanterns with a view to improving quality and bringing down costs which are essential for gaining a position in the export markets. Standardised production would have to be based on specifications for the various components which should be formulated as expeditiously as possible.

The following table summarises the development programme of the hurricane lantern industry during the period of the Plan:—

	Unit	1950-51	1955-56
1. Number of major units	Millions	11	13
2. Installed capacity	,,	4·3	4·5
3. Actual production	,,	3·2	6·0
4. Exports	,,	Negligible	1·0

13. GRINDING WHEELS

Grinding wheels are used universally in all workshops, big and small. It is an indispensable item of stores for all engineering workshops. Hence the grinding wheel manufacturing industry forms an essential link in the development of indigenous engineering industries.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—It was at the outbreak of the second world war that a factory for manufacturing grinding wheels was started in Bombay by Grindwells Ltd. Since then the firm has made progress and it has now been converted into a public limited company. The capacity of the factory which was estimated by the Tariff Board at 360 tons per annum in 1951 is, at present, about 500 tons per annum. Slight variations in the capacity are possible depending on the proportion of grinding wheels of special shapes and straight grinding wheels produced. The more the straight grinding wheels, the higher will be the production capacity.

Actual production of grinding wheels in the country was 254 tons in 1948-49, 288 tons in 1949-50, 231 tons in 1950-51 and 352 tons in 1951-52. The average monthly production during the six months ending June 1952 was 36 tons. The principal products of the industry are:—

(1) grinding wheels in all sizes and shapes up to 30″ diameter and 9″ thickness;

(2) grinding segments in all sizes and in all kinds;

(3) stones, sticks and files in all sizes and in all kinds;

(4) valve grinding paste; and

(5) thread grinding wheels.

(b) *Capital and labour.*—The initial capital invested in the factory was Rs. 5 lakhs but it has now increased to Rs. 11 lakhs. The number of workers employed is of the order of 400.

(c) *Raw materials.*—Synthetic abrasive grains, like aluminium oxide and silicon carbide, and durite liquid and powder are the principal raw materials required. Both are at present imported from the U. S. A. The other raw materials required are bakelite powder, shellac, clay and rubber. The last three are indigenously available. Synthetic abrasive grains are required to the extent of 600 tons per annum valued at Rs. 8 lakhs and durite liquid and powder to the extent of 10,000 lbs., valued at Rs. 10,000.

(d) *Imports and exports.*—As the capacity of the existing units is considered to be nearly sufficient to meet the present demand of the country for standard sizes and shapes of grinding wheels, imports are allowed only on a restricted basis. The import policy during January-June 1952 restricted the import quota to 25 per cent. of the best years' imports of all types and sizes. Imports of grinding wheels and segments amounted to 209 tons in 1950-51 and to 202 tons in 1951-52. The bulk of the imports came from the U. K. and only small consignments were imported from the U. S. A., Belgium and Italy.

(e) *Estimated consumption and requirements.*—The average consumption of grinding wheels during the last 2 years is estimated at about 500 tons per annum. The domestic demand is expected to increase to about 750 tons by 1955-56 as a result of the expansion of engineering industries.

II. Problems of the Industry

The industry has been experiencing difficulty in obtaining its requirements of synthetic abrasive grains, particularly since the outbreak of the Korean War. It is, therefore necessary to consider the possibility of bringing into existence a plant for the manufacture of synthetic abrasive grains based on the availability of electricity from the power projects under implementation. The domestic requirements are, at present, small and therefore a unit for producing synthetic grains for the small output of grinding wheels may be considered uneconomic. All these aspects should be examined and until a domestic abrasive grains industry is established, arrangements are necessary for ensuring supplies for the manufacture of grinding wheels.

III. Programme of Development

(a) *Existing programme.*—(i) Messrs. Grindwell Abrasives Ltd. have an expansion scheme for increasing their capacity to 600 tons. The capital requirement of this expansion would be of the order of Rs. 20 lakhs.

(ii) Messrs. Krishna Lal Thirani of Calcutta who are at present manufacturing coated abrasives have a plan to establish a grinding wheel factory with a capacity of 240 tons per annum at Calcutta with the technical assistance of a German firm. The capital cost of the project is estimated at Rs. 10·0 lakhs and the plant is expected to concentrate on the production among other items of those types of sections not manufactured so far in the country. The plant is envisaged to go into production in 1953 and one of the special features of this project relates to the manufacture, in due course, of synthetic abrasive grains required by the grinding wheel section of the factory.

(b) *Recommendations.*—(i) Assuming the implementation of the projects described above, the rated capacity of the industry would go up to 840 tons per annum. Hence, there would be adequate reserve capacity for grinding wheels which might be utilised for cultivating export markets under favourable circumstances. It is not, therefore, necessary to expand the grinding wheel industry further during the period of the Plan.

The following table summarises the programme of development of the grinding wheel industry during the period of the Plan:—

	1950-51	1955-56
Number of factories	1	2
Annual rated capacity (tons)	360	840
Actual production (tons)	231	750-800

C. Electrical Engineering Industries

14. DRY BATTERIES

Dry batteries, because of the semi-solid electrolyte, have the advantage of greater portability over wet batteries and find ready use where a convenient, clean and easily portable source of electric power is necessary. They have, therefore, become popular and have found diverse uses in a number of electrical gadgets and instruments used both by civilians and for defence purposes. Dry batteries are used in flashlights, cycle lamps, radio sets, post and telegraph equipment, deaf aid apparatus, medical instruments, meteorological instruments and a large number of other instruments and apparatus. In mobile field telecommunication equipment, required by the defence services, dry batteries play a very important role.

I. Brief Survey of the Industry

The first factory for the manufacture of dry batteries in India was set up by the Eveready Company of the U. K. in 1926 at Cossipore, Calcutta. The factory was later acquired by the National Carbon Co., of the U. S. A. in 1936. Estrella Batteries Ltd., were the first Indian firm to undertake production of dry batteries. During the war period, the demand for batteries for defence services increased considerably and was met almost wholly from indigenous production, which had to be expanded very substantially. Both the National Carbon Co. and Estrella Batteries Ltd. expanded their capacity and production considerably during and after the war. The industry was given protection in 1947 and since then two more new units, Sunbeam Electrical Industries Ltd., Bombay and Solar Batteries and Flashlights Ltd., Bombay, have come into production.

(a) *Location, rated capacity and production.*—There are, at present, four companies engaged in the manufacture of dry cells. They are:—

(1) National Carbon Co. (India) Ltd., Calcutta.

(2) Estrella Batteries Ltd., Bombay.

(3) Sunbeam Electrical Industries Ltd., Bombay.

(4) Solar Batteries and Flashlights Ltd., Bombay.

Of these, the first three are established manufacturers, while the fourth, have only recently commenced manufacturing dry batteries.

The total rated capacity of the industry was estimated at 285·0 million cells per annum by the Tariff Board in their latest enquiry in 1950. The actual production of the industry during recent years has been as follows:—

Year	Quantity (millions)	Value (lakhs of Rs.)
1948	123 8	283·5
1949	152·3	348·5
1950	138·2	316·0
1951	143·4	329·0

(b) *Capital and labour.*—Although definite information on the total capital invested in the industry is not available, it is estimated that it is of the order of Rs. 120 lakhs. The labour employed is about 2,500.

(c) *Raw materials.*—The main raw materials used in the manufacture of dry batteries are manganese dioxide, graphite and carbon rods. Electrolytic materials consist of chlorides of ammonium, zinc, calcium, magnesium and mercury, all of high purity, used singly or in combination, and wheat flour and starch are used as gelatinising agents. Containers, caps and connecting strips are made from zinc and brass sheets. The industry is dependent to a considerable extent on imported raw materials. It is estimated that the proportion of indigenous to imported raw materials in the manufacture of dry batteries is about 29:71. The more important raw materials for which the industry is dependent on imports are manganese dioxide, graphite, lampblack, carbon, zinc sheets, ammonium chloride, zinc oxide, zinc chloride, calcium chloride and mercury chloride. Manganese dioxide ore is available in India but the quality of the indigenous ore is not suitable and affects the quality of the cells adversely. It should, however, be possible after suitable treatment to improve the quality of the ore. Fairly satisfactory results have been obtained when the indigenous manganese dioxide ore has been used with an equal quantity of imported manganese dioxide. Estrellas are at present reported to be using equal quantities of indigenous and imported ore.

(d) *Imports and exports.*—Before the second world war, the bulk of the imports of dry batteries came from the U. S. A. ; other exporters to India were Germany, Hong Kong, the U. K. and Japan. During the war period, there were practically no imports and in 1947, the Government imposed a total ban on the import of dry batteries. This ban has virtually cut off all imports since then. Only very special types of dry batteries not made in India have been allowed to be imported. The value of such imports came to Rs. 16·7 lakhs in 1950-51 and Rs. 24·3 lakhs in 1951-52.

There has been some export of dry batteries to neighbouring countries like Burma, Turkey, Ceylon, Egypt and other Middle East countries. It is estimated that the industry exported about 3·9 million cells in 1947, 1·2 million cells in 1948 and 80,000 cells in the period from January to September, 1949.

(e) *Estimated consumption and requirements.*—More than 50 per cent. of the demand for dry batteries, which was of the order of 40 million cells in pre-war years, was met from imports. The demand increased remarkably during the war and the post-war years and the Tariff Board Report on the Dry Battery Industry (1947), estimated the demand at 150 million cells per annum during the years 1947-50. As a result of a subsequent review of the industry by the Tariff Board in 1950, the demand for the three years 1950, 1951, 1952 was placed at 180, 200 and 220 million cells, respectively. The last estimate of the demand included the requirements of radio batteries of 90 volts used for dry battery radios, which was assessed at 200,000 batteries in 1950 by the representatives of the All-India Radio Merchants Association, Bombay.

The actual consumption of dry cells as represented by the sum of indigenous production and imports was 131·6 millions in 1948-49, 170·0 millions in 1949-50 and 147·5 millions in 1950-51, and accordingly the present demand might reasonably be assumed to be about 160 million cells per annum. This figure is considerably below the installed capacity.

The demand for dry cells is expected to increase to 320 millions by 1955-56 on the following basis:—

Flashlight Batteries	175 millions
Defence	25 „
Radio	100 „
Export	20 „
TOTAL	320 „

II. Problems of the Industry

The problems of the industry relate essentially to (1) difficulties in procuring certain vital raw materials and (2) the inability of the industry to work to full capacity.

Considerable difficulty was experienced in obtaining raw materials from abroad due to the general scarcity conditions prevalent in the world market. This difficulty could be obviated to a great extent by developing indigenous raw materials wherever supplies are available to suit the requirements of the industry as in the case of manganese dioxide, graphite, carbon rods and chemicals. Efforts, therefore, must be made by the industry, in co-operation with the chemical manufacturers and national laboratories, to evolve processes for the production of manganese dioxide and other chemicals. Apart from saving considerable foreign exchange, self-sufficiency in some of these essential materials would be of immense benefit to the industry in abnormal times. Similarly, various kinds of cardboard and paper required by the industry should be made available from indigenous sources. With regard to non-ferrous metals like zinc, the Government should assist the industry in procuring them in sufficient quantities to meet its needs.

Lack of adequate demand has resulted in the non-utilisation of a considerable percentage of the rated capacity. The export market developed in neighbouring countries should be sustained and widened by a constant effort at improving the quality and reducing the price of the finished product by effecting economy in the utilisation of raw materials and by improved methods of production. It should be possible to widen the internal market also by a more efficient system of distribution and adequate publicity.

III. Programme of Development

(a) *Existing programme.*—(i) The National Carbon Co., have been given permission to manufacture layer-built batteries with an annual capacity of 24 million cells. Their total capacity for all types of dry batteries would be increased by 25 million cells per annum. They have already acquired a site with buildings in Madras for their new factory and are expected to commence production by the end of 1952.

While the establishment of a factory for layer-built batteries as proposed by the National Carbon Co., has to be encouraged, there is no need for establishing additional units during the period of the Plan as the demand can be adequately met from the existing units and the expansion mentioned above.

(b) *Recommendations.*—The following recommendations are made for the future planned development of the industry:—

(i) The existing capacity of the dry battery industry, *viz.*, 285·0 million cells, is expected to be augmented by 25 million cells as a result of the expansion programme of the National Carbon Company. This expanded capacity could adequately take care of the demand anticipated by 1955-56 and

therefore, no new factories should be allowed to be established during the period of the Plan.

(ii) The industry has developed an export market in the post-war period. Efforts should be made to step up exports and the Government might consider the inclusion of cells in bilateral trade agreements with neighbouring countries. With a view to stimulating exports the Government may also consider the possibility of granting remission of import duty on raw materials actually consumed for the manufacture of cells for export.

(iii) Suitable grades of indigenous manganese dioxide should be evolved through research and geological surveys, so that the industry may become self-sufficient with respect to this raw material.

(iv) Since the industry is predominantly dependent on imports for its vital raw materials, efforts should be made by it in co-operation with other manufacturers to develop the indigenous manufacture of graphite, lampblack, carbon rods, zinc sheets, special types of paper, paper-boards and chemicals.

The table given below summarises the programme of development of the industry during the period of the Plan:—

	Unit	1950-51	1955-56
Number of units	..	4	5
Annual rated capacity	Million numbers	285	310
Production	„	136·5	320*

*Higher production would be achieved by operating the industry on more than one shift.

15. STORAGE BATTERIES

Storage batteries are used for various purposes, but their widest use is as a vital part of a modern motor car. A storage battery is essential in engines fitted with coil ignition, but even where magneto ignition is employed it is a great convenience, since it allows the use of a self-starter and of electric lighting which can be fully effective even when the car is stationary. Storage batteries are also similarly used in the starting mechanism of various types of aircraft. Where electric power supply from the mains is not readily available, storage batteries can also be effectively used for the operation of radio sets. In unelectrified areas and out of the way places such as tea plantations and hill stations, high capacity storage batteries are known to be used for domestic lighting. In the power stations, banks of storage batteries are always kept fully charged as a stand-by. Train lighting is also effectively achieved by the use of special types of train lighting batteries in the under carriages of railway coaches and these batteries are charged by train lighting dynamos. Storage batteries, therefore, play an important part in facilitating modern transport and lighting.

I. Brief Survey of the Industry

The first attempt to manufacture batteries for motor vehicles was made in 1931, by the Tropical Accumulators, Calcutta. By 1939, a number of other factories such as Bharat Battery Manufacturing Co.; Electric Chemical Industry; Indian Battery Manufacturing Co.; Eastern Accumulator Co.; and Mazumdar Battery Co.; were established in Calcutta. All these units were small and their total production could meet only a tiny fraction of the indigenous demand so that the major part of the requirements had to be met through imports. During the war various attempts were made to expand the indigenous industry to meet the huge demand from the Defence Services. The more important firms which came into existence during this period were :—

> (1) Estrella Batteries Ltd., Bombay (1939), (2) Standard Batteries Ltd., Bombay (1943) and (3) Chloride Electrical Storage Co. (India) Ltd., Calcutta (1945). In the initial stages, the containers for batteries were imported; but gradually the manufacture of containers was also taken up in the country.

The battery plant of the General Motors (India) Ltd., is the most important unit established in the post-war period.

(a) *Location, rated capacity and production.*—As a result of protection granted in 1948 on the recommendation of the Tariff Board, the industry has registered remarkable progress in recent years. The number of organised units rose from 11 with an annual rated capacity of 265,900 batteries in 1948 to 13 with an annual rated capacity of 412,000 batteries in 1949. The capacity increased further to 534,820 batteries per annum on single shift operation in 1951 with the expansion of some of the existing units and the coming into production of 5 new units. Taking into account the Acme Battery Manufacturing Co. Ltd., Delhi—Shahdara, which is also on the active list of the Development Wing of the Ministry of Commerce and Industry, the rated capacity of the industry is now 538,420. Of the 19 units at present in existence, eleven have an annual capacity of over 10,000 batteries and account for about 92 per cent. of the total capacity. Three of these eleven major units which came into production during the period of the Plan (Oldham & Sons Ltd.,

Madras; Mysore Electro-Chemical Works, Bangalore; and Free India Dry Accumulators, Calcutta) have a combined capacity of 75,000 batteries per annum. The present regional distribution of the industry is as under:—

State	Number of units in 1951	Annual rated capacity on basis of single shift operation for 300 days per annum (1951)	Actual production		
			1949	1950	1951
West Bengal (Calcutta)	7	225,100	58,557	79,458	110,862
Bombay, including Kolhapur	8	232,100	48,752	108,422	133,182
Mysore	2	52,620	2,992	879	3,940
Madras	1	25,000	..	..	3,600
Delhi	1	3,600	..	..	*N.A.*
TOTAL	19	538,420	110,301	188,759	251,584

N.A. Not available.

As the above statistics show, actual production of batteries within the country has shown about 130 per cent. increase between 1949 and 1951.

(b) *Capital and labour.*—The total number of workers employed by the industry has been estimated at about 1,700. Figures of the capital invested are not available for all the factories.

(c) *Raw materials.*—Storage batteries essentially are built up of four different components, *viz.*, containers, plates, separators and terminals. Although all these components were imported before the war, steps have since been taken to produce some of the essential materials and equipment. Some of the large battery manufacturers have put up equipment for the manufacture of their own containers. There are at present four firms in the country engaged in the manufacture of battery containers and their total capacity is estimated at about four lakhs of containers per annum. While three of these firms are using vulcanised rubber for manufacturing containers, the fourth uses asbestos composition. Asbestos for this purpose is imported, but it should be possible to use indigenous asbestos for the manufacture of containers after suitable processing. The National Chemical Laboratory is at present conducting investigations into the possibility of using Indian asbestos for the manufacture of battery containers.

Lead, lead-oxide and antimony are the essential raw materials for the manufacture of battery plates. Lead is entirely imported from Australia and Burma. Lead-oxide is manufactured in the country, and its quality is suitable for the industry. Some of the battery manufacturers have set up sub-oxide plants for manufacture of lead-oxides. Antimony is available indigenously. But the raw material for its manufacture has to be imported since the Chitral deposits have fallen to Pakistan.

Wooden separators were till recently imported from the U. S. A. or Canada; five firms have now embarked on their manufacture from indigenous timber and they have a total capacity of 25 million separators per annum.

As the industry is situated at present, it has to depend largely on imports for essential raw materials. It is estimated that based on values, only 20 per cent. of the raw materials required by the industry, are derived from indigenous sources at the present time.

The average requirements of the principal raw materials for producing 340,000 batteries are as under:—

Lead	2,500 tons
Antimony	175 „
Lead oxides	2,700 „
Rubber compound for container, cover and plug	1,600 „
Separators (Numbers)	17·0 million

(d) *Imports and exports.*—The average value of batteries (and their parts) imported during the period 1948-51 has been of the order of Rs. 22 lakhs per annum. The import of batteries in 1950 (January-December) was only of the order of 5,000 but during the first ten months of 1951 (January-October) it went up above 13,000. After the cancellation of Open General Licence XI for imports from sterling and soft currency areas in May 1949, no licences were issued in the latter half of 1949 except for batteries required against orders of the Posts, Telegraphs and Railway Departments. No licences were granted during the first half of 1950; and during the second half of 1950 licences were granted to established importers only to a limited extent. The same policy was more or less continued for the second half of 1951 and the first half of 1952. Exports are allowed liberally at present, but no figures of exports are available.

(e) *Estimated consumption and requirements.*—The demand for storage batteries which was of the order of 60,000 units per annum in pre-war years, was met almost entirely through imports. The demand increased remarkably during the war and the post-war years and, according to the Report of the Tariff Board on the Motor Vehicle Battery Industry (1948), it was estimated at 250,000 batteries per annum during the years 1948-50. On the basis of the number of cars and trucks on the road, it has been estimated by the Development Wing of the Ministry of Commerce and Industry that the demand for motor vehicle batteries does not exceed 275,000 per annum. This demand could be met from the existing capacity of the industry.

It is difficult to make an accurate forecast of the future demand which will mainly depend upon the number of motor vehicles on the road in any particular year. It may, however, be reasonably presumed that that the requirements of motor vehicle batteries will be in the neighbourhood of 300,000 to 350,000.

II. Problems of the Industry

The most important problem of the industry is that of raw materials. As already explained, the industry is almost entirely dependent on imports for the supply of its most essential raw materials. This has caused considerable difficulty to the industry in recent times and was responsible for the increased cost of production. The industry should exercise the maximum economy in the consumption of the two principal raw materials, lead and rubber. Also it should examine the possibilities of recovering lead from scrap and establishing plants for reclaiming rubber. The main problem in this connection would be the organisation of the collection of lead scrap and old rubber tyres. Some of the Government agencies which are major consumers of batteries could assist the industry if batteries are returned at the time of discarding them.

Apart from rubber the battery manufacturers make use of imported asbestos required in the production of containers. Investigations should be made into the possibilities of utilising indigenous asbestos for this purpose in co-operation with the National Laboratories.

In spite of the improvements achieved by the manufacturers, there is still considerable prejudice against indigenous batteries. The Government have assisted the industry in overcoming this prejudice by placing orders for their battery requirements with the indigenous manufacturers. The formulation of standard specifications would provide a solution to the problem of consumer prejudice by facilitating better understanding between producers and consumers.

III. Programme of Development

(a) *Existing programme.*—The annual rated capacity of the five units which have gone into regular production during the period of the Plan is as under :—

	Annual rated capacity (Numbers)
Free India Dry Accumulators, Calcutta	30,000
Mysore Electro-Chemical Works, Bangalore	20,000
Oldham and Sons Ltd., Madras	25,000
Kolhapur Auto Works, Kolhapur	9,000
Modern Battery Manufacturing Co., Bombay	5,000
TOTAL	89,000

Free India Dry Accumulators have started " dry type " accumulators and Oldham & Sons will, at the end of two years, concentrate on the production of heavy duty and traction batteries. Messrs. Standard Batteries are at present engaged on the extension of their range of production by including the manufacture of heavy duty traction batteries, nickel-iron cells and electric vehicle batteries. But the production of nickel-iron cells depends on the possibilities of obtaining regular orders from the railways.

(b) *Recommendations.*—(i) The rated capacity of the industry in 1952 has attained 538,420 units per annum. It will be seen that the installed capacity should be more than sufficient to meet the demand anticipated by 1955-56. It is, therefore, not considered necessary to establish any new units during the period of the Plan. However, it is desirable to make the country self-sufficient in regard to the heavy duty traction batteries and train lighting and stationary batteries for which it is more or less dependent on imports at present. Indigenous manufacturers should be assisted in diversifying their range of production for achieving self-sufficiency in respect of all kinds of batteries.

(ii) *Export of batteries.*—The industry should cultivate export markets in the Middle East and South East Asian countries where there is scope for marketing Indian batteries. The Government should also afford the necessary encouragement to enable the industry to export its products in increasing quantities.

The following table summarises the programme of development of the storage battery industry during the period of the Plan:—

	1950-51	1955-56
Number of units	13	19
Annual rated capacity (Numbers)	445,820	538,420
Actual production (Numbers)	200,000	400,000
Estimated requirements for domestic consumption and export (Numbers)	250,000	400,000

16. ELECTRIC CABLES AND WIRES

The distribution of electricity is dependent, to a large extent, on the availability of cables and wires of various sizes and dimensions. The programme of power development envisaged by the Government and by private electricity undertakings calls for the supply of electric cables of all types ranging from supertension heavy mains cables for long distance power transmission to low voltage underground mains cables and household wiring cables and flexibles. The development of the cable industry on sound lines has, therefore, a special significance in the context of the large-scale power development envisaged.

Before the war when the Indian Cable Company at Tatanagar was the only factory producing cables and wires the requirements were met to a large extent by imports. Increased demand for meeting war requirements, coupled with import difficulties, resulted in the expansion of the indigenous industry during the war period. The National Insulated Cable Co. of India Ltd., Calcutta, was established at that time. Since then two more firms have come into existence and it can be said that the electric cable industry is fairly well-established at the present time.

I. Brief Survey of the Industry

The types of electric cables in demand can be broadly divided into (i) bare and reinforced conductors for power transmission and distribution, *e.g.*, bare copper conductors solid and stranded, plain and steel reinforced aluminium conductors, copper weld conductors, etc.; (ii) electrical winding and instrument wires such as cotton, silk and enamel covered insulating wires; (iii) electrical installation cables like rubber insulated cables and plastic insulated cables; (iv) power cables; (v) communication cables like dry core paper insulated telephone cable, etc. Of these, bare copper conductors, aluminium conductors (A. C. S. R.) winding wires (cotton and silk covered), rubber insulated cables and plastic insulated cables are manufactured at present in the country.

(a) *Location, rated capacity and production.*—There are now four organised manufacturers of cables and wires. While two of these factories are situated in Calcutta and Tatanagar, the remaining factories are located near Alwaye in Travancore-Cochin and Bangalore. They are (i) The National Insulated Cable Co. of India Ltd., Calcutta; (ii) The Indian Cable Co. Ltd., Tatanagar; (iii) Aluminium Industries Ltd., Kundara; and (iv) Radio and Electrical Manufacturing Co. Ltd., Bangalore (REMCo.).

They do not all produce the same kind of wires and cables. Thus while the National Insulated Cable Co. of India and the Indian Cable Co. produce bare copper conductors, winding wires and rubber insulated cables and flexibles, REMCo. manufactures plastic insulated cables and flexibles only. A. C. S. R. conductors are produced by Aluminium Industries Ltd., and the National Insulated Cable Co. of India. The total annual rated capacity for the various types of cables and wires in 1950-51 and the production in the last 3 years are given below:—

Annual rated capacity and actual production of wires and cables

	Rated capacity in 1950-51	Actual production		
		1949	1950	1951
Bare copper conductors (tons)	20,000	5,723	5,675	2,996
Winding wires (tons)	450	340	248	296
A. C. S. R. conductors (tons)	2,500	30	1,420	1,720
Rubber insulated cables and flexibles (million yards)	45·0	19·4	34·0	41·1
Plastic insulated cables and flexibles (million yards)	20·0	*N.A.*	1·084	1·983

N.A.—Not available.

The fall in production of bare copper conductors and winding wires during 1951 was due to the difficulty in obtaining copper bars from abroad.

(b) *Capital and labour.*—The total capital invested in the industry is not known. The total number of persons employed is about 1,800.

(c) *Raw materials.*—Copper rods and wires, aluminium rods, galvanised steel wire, antimony, lead and tin ingots are the principal products of the metallurgical industry required for the manufacture of the different cables and wires mentioned above. For the production of rubber insulated wires and flexibles, rubber smoked sheets and rubber pale crepe are also required. Similarly, plastic insulated wires and flexibles consume polyvinyl chloride (PVC) and polythene; winding wires require cotton and silk yarn. The important raw materials required for the production of 7,000 tons of bare copper conductors, 1,400 tons of winding wires, 80 million yards of rubber insulated cables and flexibles, 5,000 tons of A. C. S. R. cables and 20 million yards of plastic insulated cables and flexibles are approximately as follows:—

Item	Quantity
(i) Electrolytic copper rods	10,000 tons
(ii) Lead ingot	1,200 ,,
(iii) Cotton yarn	190 ,,
(iv) Calico cloth of 40″ width	1,071,700 yds.
(v) Polyvinyl chloride	190 tons
(vi) Electrolytic aluminium rods	3,060 ,,
(vii) High tensile galvanised steel wire	1,250 ,,

The industry is at present dependent on external sources for meeting a large percentage of its raw material requirements, the principal imported products being electrolytic copper bars from which copper rods are indigenously produced, electrolytic aluminium rods, galvanised steel wire, lead and tin ingot and polyvinyl chloride.

(d) *Imports and exports.*—Imports and exports in precise categories are not available. The Sea-borne Trade Accounts indicate the imports of cables and wires in terms of value only. In order to give a more correct picture of the supply position, it is necessary to specify the imports in terms of quantity at least for the main categories of cables and wires. Imports in terms of value of these materials during recent years were as under :—

	1949-50 ('000 Rs.)	1950-51 ('000 Rs.)	1951-52 ('000 Rs.)
(i) Rubber insulated cables	94,83	1,23,84	51,96
(ii) Wires and cables, insulated other than (i)	4,21,64	1,96,63	2,50,40
(iii) Telegraph and telephone wires and cables	34,70	80,54	3,46
(iv) Bare copper wire	1,92	2,12	3,50
TOTAL	5,53,09	4,03,13	3,09,32

There is no information on the quantity of cables and wires exported; but it is not likely that these items were exported to any substantial extent.

(e) *Estimated requirements and consumption.*—The present demand for different items of cables and wires has been estimated variously by different agencies and manufacturers. The estimated requirements in 1950-51, on an average, were as follows:—

1. Bare copper conductors	6,000/7,000 tons per annum
2. Winding wires	1,250 tons per annum
3. Rubber insulated cables, plastic insulated cables and flexibles	65 to 80 million yards per annum
4. A. C. S. R. cables	5,000 tons per annum

The future rate and pattern of demand would depend on a number of factors such as the rate of generation of electricity and the completion of various multi-purpose projects, industrial and housing expansion schemes and the relative availability of competing raw materials like copper and aluminium. Acute shortage of copper in recent years has been responsible for a shift in demand in favour of A. C. S. R. cables at the expense of copper conductors. Although the supply position of copper has since then eased to some degree, this shift is likely to continue provided aluminium becomes available at a cheap rate. The major industries consuming winding wires are the electric fan, electric motor and electric transformer industries. Considerable expansion of production of fans, motors and transformers has been envisaged so that the demand for winding wires is expected to increase during the period of the Plan. Taking all factors into consideration, it is estimated that the requirements of the country would increase approximately by 40 to 50 per cent. by the end of the period of the Plan. Annual requirements for various items of the industry by 1955-56 are expected to be as follows :—

1. Bare copper conductors	10,000 tons per annum
2. Winding wires	1,875 tons per annum
3. Rubber insulated and plastic cables and flexibles	105 million yds. per annum
4. A. C. S. R. cables	8,000 tons per annum

II. Problems of the Industry

The difficulties of the industry arise, as already indicated, from its dependence on imports for some of its essential raw materials. Fluctuations in the international market cause considerable hardship to the industry. In certain respects, at any rate, it is possible to make up this deficiency by planning the manufacture of such materials for which resources are available in the country. At present 3/8″ electrolytic aluminium rods are imported. The Aluminium Industries Ltd., Kundara, have applied to the Central Government for permission to instal a rod mill in their factory with an annual installed capacity of 3,000 tons of 3/8″ rods in the first stage and of 4,500 tons on completion of the second stage. The cost of the entire project is estimated at Rs. 20 lakhs, out of which the first stage would account for Rs. 14 lakhs. According to present expectations, the rod mill is expected to be in production by the middle of 1954. Before the close of the period of the Plan, the rod mill hopes to make use of electrolytic grade nuggets produced by the Indian Aluminium Co. at Alwaye. On the completion of the scheme, the requirements of electrolytic rods for the A. C. S. R. conductors industry would be met to a great extent from domestic sources. Similarly, high tensile galvanised steel wire which is imported from the U. S. A. and Western Europe could be produced by the existing manufacturers of wires and wire products by necessary addition to or modification of the existing machinery. A good deal of difficulty was experienced by the industry by the heavy import of copper conductors and winding wires in recent years. If it is possible, it would be desirable to import electrolytic copper bars in larger quantity and produce the conductors in the country for which there is adequate capacity.

III. Programme of Development

(a) *Existing programme.*—The Indian Cable Company have under implementation a scheme for the manufacture of electrolytic copper rods and of paper insulated power cables, plastic wires and cables, enamelled wires and other types of cables not hitherto manufactured in the country. The programme is expected to be completed by 1954. The capacity of the firm for cotton covered and enamel winding wires will increase to 800 tons per annum.

The National Insulated Cables Company of India have been permitted to manufacture wires and cables in technical collaboration with a Japanese firm. For this the additional capital required in the period of the Plan will be of the order of about Rs. 2·5 lakhs. The Aluminium Industries Ltd., Kundara, have already planned to increase the production capacity of A. C. S. R. cables from 2,000 tons to 4,500 tons per annum and machinery worth Rs. 4·0 lakhs was ordered for implementing this programme. They have also under examination a scheme for the manufacture of insulated aluminium conductors for which the demand is estimated at 500 tons per annum.

The Government of India, in technical consultation and agreement with the Standard Telephones and Cables Ltd., of the United Kingdom, is setting up a Dry Core Cable Factory for the manufacture of telephone cables at Rupnarainpur in West Bengal. The land required for the factory has already been purchased, and orders for the machinery and equipment have been placed, part of which has already arrived. The factory which is expected to be completed by 1953-54 will be able to manufacture communication cables worth about Rs. 80 to Rs. 100 lakhs per annum. The investment on the project during the period of the Plan is expected to be Rs. 1·3 crores. This project will make the postal and telegraph department independent of imports for meeting their requirements. The productive capacity for different types of cables is envisaged by the Dry Core Cables Factory as under :—

I. *Paper insulated, air spaced, dry core, lead covered unit type subscribers' cable*

Specification	Miles of cable
6·5 lb./mile unarmoured	55 miles
10 lb./mile unarmoured	5 ,,
10 lb./mile half armoured and half unarmoured	59 ,,
10 lb./mile armoured	180 ,,
20 lb./mile armoured	20 ,,

II. *Paper insulated, air spaced, dry core, lead covered star-quad trunk type cable*

Specification	Miles of cable
40 lb./mile armoured	150 miles
TOTAL	469 miles

(b) *Recommendations.*—(i) In view of the fact that there is no data regarding the quantities of electric wires and cables imported into the country, it is somewhat difficult to assess accurately the demand for the different types. The possibility of interchange between copper and aluminium cables depending on relative prices, is another factor which makes the task of forecasting demand complex. In the circumstances and in view of the difficulties of obtaining supplies of electrolytic copper to operate the existing capacity of the industry to the fullest extent, there should be a comprehensive examination of exact requirements *vis-a-vis* the expansion programme described above before permission is given for the establishment of any new units. When new units or further expansions are licenced, it should be mainly for covering items not produced in the country, because electrolytic copper supplies which are short, should be utilised to the best advantage.

(ii) The industry is dependent for certain raw materials on foreign countries. A scheme for a copper scrap refinery was under consideration for some time, but has been given up for want of finance. There are, at present, no projects for the manufacture of

polyvinyl chloride although there are possibilities of developing the manufacture of this resin starting from alcohol. The proposals regarding production of aluminium rods and high tension galvanised steel wire have been mentioned under Problems of the Industry. The Government should afford all possible assistance for the implementation of these schemes and arrange for an increase of releases of electrolytic copper by taking up this question at the International Materials Committee.

The following table summarises the programme of development of the Electric Wires and Cables Industry during the period of the Plan:—

	1950-51	1955-56
Number of units	4	5
Annual rated capacity—		
(i) Telegraph and telephone wires and cables (Million ft.)	*Nil*	2·5
(ii) A. C. S. R. cables (tons)	2,500	5,000
(iii) Insulated aluminium conductors (tons)	*Nil*	500
(iv) Winding wires (tons)	450	1,100
(v) Rubber and plastic insulated cables and flexibles (Million yds.)	65	119
(vi) Paper insulated power cables (miles)	*Nil*	400

17. ELECTRIC FANS

Electric fans have been universally adopted for the circulation of air in residences, public offices, business centres, railway carriages and factories. In industry, it is also used for circulating all types of gases. Various kinds of fans are manufactured, the more important of them being ceiling fans, table fans, railway carriage fans, pedestal fans and industrial fans such as exhaust fans, air blowers, etc. Industrial fans are not yet produced in the country on a commercial scale.

I. Brief Survey of the Industry

The first organised factory for the manufacture of fans was set up in 1924 by Messrs. India Electric Works Ltd., Calcutta. The success of this pioneering Company encouraged others to enter the field so that by 1939 about half a dozen firms were manufacturing fans with a rated capacity of 40,000 fans per annum. The last war gave an impetus to the indigenous industry and the establishment of a number of new units and expansion of existing units increased the production capacity considerably.

(a) *Location, rated capacity and production.*—During 1950-51 there were 22 units on the active list of the Development Wing of the Ministry of Commerce and Industry (D. W. C. I.) as manufacturers of electric fans having a capacity of 288,000 fans per year. Some of these units have since been removed from the list and at present there are 18 firms which may be considered as regular and established manufacturers of fans. The total installed capacity of these firms has been assessed at 293,600 fans per year on the basis of a single shift operation for 300 days.

The State-wise distribution of the industry at present is as follows :—

Area.	Number of factories.	Installed capacity. (Numbers).
Calcutta	10	214,600
Bombay	3	50,000
Delhi	4	26,500
East Punjab and PEPSU	1	2,500
TOTAL	18	293,600

If the factories removed from the active list of the D. W. C. I. and other unorganised units are taken into consideration, the total rated capacity of the industry may be estimated at about 300,000 fans per annum.

The production of fans, though considerably below capacity, has shown a steady upward trend during recent years. The production in 1948, 1949 and 1950 was 158,750 fans (valued at Rs. 222 lakhs), 170,840 fans (valued at Rs. 239 lakhs) and 193,800 fans (valued at Rs. 271 lakhs) respectively. The production in 1951 came to 212,495 fans. The gap between rated capacity and actual production is partly due to shortage of raw materials, both indigenous and imported, such as, electric sheets, pig iron, winding wires, etc.

(b) *Capital and labour.*—Accurate data on the capital invested in the electric fan industry is not available, but it is estimated that it is of the order of two crores of rupees. Approximately 7,500 workers are employed by the eighteen firms, mentioned above, on the active list of the D. W. C. I.

(c) *Raw materials.*—A large variety of raw materials are used in the manufacture of electric fans. Many important items like winding wires, resistance wires, ball bearings, insulating materials, etc., have to be imported while pig iron, M. S. rods, sheets and plates, electrical steel sheets and stampings and porcelain parts are obtained from indigenous sources. The scarcity of raw materials, both indigenous and imported, has been a factor restricting the utilisation of the existing capacity to the full. More than 50 per cent. of the raw materials required were of imported origin in 1950 indicating an inherent weakness in the structure of the industry and the need to reduce dependence on imported raw materials as far as possible. However, some ancillary industries are being developed in the country which will meet the requirements of the fan industry more than is being done at present. For instance, it should be possible in the near future to do without the imports of nitrocellulose paints, bearings and also brass screws, nuts, belts, washers, etc.

A few of the more important raw materials required for the production of 250,000 fans are as under:—

Enamelled copper wires	250 tons.
Winding copper wires (other than enamelled)	150 „
Non-ferrous metals, such as brass bars, rods, tubes, sheets, & brass & phosphor bronze wires, etc. .	250 „
Aluminium sheets, copper sheets, hard drawn bare copper wire, brass ingots, lead, etc. . .	500 „
Ball bearings (Numbers)	500,000 „

(d) *Imports and exports.*—Imports of fans have been under control for the last few years. No licences for imports of ceiling fans have been issued since 1949, but imports of table fans were allowed to a limited extent. The total value of "electric fans and parts thereof" imported into the country during 1948-49, 1949-50, 1950-51 and 1951-52 was nearly Rs. 2 lakhs, Rs. 7 lakhs, Rs. 3 lakhs and Rs. 5·5 lakhs respectively, the average imports during this period being Rs. 4 lakhs per annum. The bulk of these imports has come from the U. K. On a rough estimate, taking Rs. 100 as the c.i.f. value of a table fan, it can be said that the average number of fans imported annually during this period will only have been 4,000.

Statistical information on the quantity and value of fans exported is not available. It is, however, known that the industry has begun to develop an export market in neighbouring countries such as Pakistan, Burma, Ceylon, Siam, Malaya and Indonesia.

(e) *Estimated consumption and requirements.*—It has been estimated by the D. W. C. I. that the present demand for fans is about 212,000 per annum consisting of 140,000 ceiling fans, 60,000 table fans and 12,000 railway carriage fans, which is considerably lower than the existing installed capacity. It can reasonably be expected that when the large number of multi-purpose projects now under implementation are completed, the demand for fans will go up considerably even granting that lighting and agricultural demands would have a prior claim on the additional power that would be generated. It is, therefore, envisaged that the demand for fans would increase to 320,000 fans per annum by 1955-56.

II. Problems of the Industry

The most difficult problem of the industry as already indicated, is the supply of adequate quantities of raw materials. Such essential raw materials as winding wires, carbon brushes, ball bearings and even high class paints and varnishes have to be imported. The Government should render all possible assistance to the industry in obtaining these scarce materials from abroad. Among indigenous raw materials, steel, pig iron and electrical steel sheets are in acute shortage and the requirements of the industry have to be

met through arrangement of imports. The development of ancillary industries to meet the requirements of the fan industry with a view to curtailing the dependence on foreign countries should increasingly engage the attention of the industry and the Government.

III. Programme of Development

(a) *Existing programme.*—Messrs. Kassels Ltd., one of the existing producers, have under their expansion scheme recently started the manufacture of railway carriage fans and table fans in their Poona Factory. The additional capacity that will be achieved is expected to be 5,000 fans per month at the beginning and to increase gradually to 10,000 fans per month.

(b) *Recommendations.*—(i) With the implementation of the above expansion project, the capacity of the industry would increase by 1952 to nearly 360,000 fans per annum which is in excess of the estimated requirements by 1955-56. It is, therefore, not considered necessary, except in special circumstances, to establish additional units. The industry should, however, concentrate its efforts on improving the quality and finish of the products, particularly with a view to attracting the foreign market. This applies especially to indigenous table fans and railway carriage fans which have considerable scope for improvement. In addition, the industry could also take up the manufacture of industrial fans and other special types of fans which are not at present produced on a commercial scale.

(ii) In order to enable the industry to work to its maximum capacity, it will be necessary to establish a market for fans in neighbouring countries. To enable the indigenous manufacturers to stand competition from other producers, it may be necessary to allow rebate of duty on imported raw materials used in the manufacture of fans actually exported. The Government should favourably consider the possibility of rendering any such assistance at the proper time.

The following table summarises the programme of development of the electric fans industry during the period of the Plan :—

	1950-51	1955-56
Number of units	22	18
Annual rated capacity (Nos.)	288,000	360,000
Actual production (Nos.)	194,100	320,000 to 350,000
Domestic requirements (Nos.)	212,000	320,000

18. ELECTRIC LAMPS

As a means of quick and efficient illumination, electric lighting has been widely adopted wherever electric energy is available. The use of electric lamps has become so general that they have become indispensable in offices, factories, railways and almost all public and private buildings. With the implementation of the multi-purpose projects undertaken by the Central and State Governments, electric energy will become available in an increasing volume over a large part of the country and will contribute to the wider adoption of electric lighting. In the circumstances the planned expansion of the electric lamp industry and diversification of its production requires to be considered.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—Although the lamp industry was established in India as early as 1932, it was during the last war that it received proper attention and encouragement and it has developed to a considerable extent during the post-war period. The types of electric lamp manufactured in the country are the general lighting service (G. L. S.) types, and the train lighting types. More recently the manufacture of miniature types like automobile and flashlight lamps has also been undertaken.

Inclusive of the Osler Electric Lamp Manufacturing Co., whose plant has gone into production recently, there are at present 11 units manufacturing electric lamps with a total rated capacity of 26 million pieces per annum on the basis of a single eight-hour shift and 300 working days. Six of these units with an annual rated capacity of 15 million pieces are located in Calcutta while the rest with a total annual capacity of 11 million pieces are distributed in Bombay, Uttar Pradesh, Bihar and Mysore. The production of lamps, however, has been considerably below capacity and in the last four years 1948, 1949, 1950 and 1951, the lamp industry produced 9·25 million, 13·64 million, 14·31 million and 15·52 million pieces respectively. Production in 1952 has been estimated at 20·0 million.

(b) *Capital and labour.*—The capital invested in the electric lamp industry is not known. The labour employed in the industry is estimated at about 2,000.

(c) *Raw materials.*—The electric lamp industry is entirely dependent on imports for most of the raw materials and components. The requirements of the principal raw materials for a production of 23 million lamps have been estimated as follows:—

	Quantity	Value (Rs. in lakhs)
Glass tubings and rods	270 tons	9·0
Chemicals	10 „	1·0
Tungsten wires and coiled filaments	26·0 million meters	18·0
Molybdenum wire	3·0 „	1·0
Solder wire (multi-Rosin cored)	5·0 tons	0·3
Capping cement	50 „	1·8
Argon and Nitrogen gases	870,000 c. feet	8·7
Leading-in wires	55·0 million pieces	2·75
Brass caps	26·5 „	10·6
Glass Shells	26·0 „	26·0
Steel Mandrill wire	1·0 ton	0·5

All these raw materials have to be imported at present with the exception of a part of the requirements of glass shells met from domestic sources.

(d) *Imports and exports.*—Electric lamps other than G. L. S. lamps are imported in fairly large quantities every year. The imports mainly consist of bulbs for torches, bulbs for automobiles and other kinds of electric lamps. The imports in the last three years, 1949-50, 1950-51 and 1951-52 were as under:—

Type of Lamps	1949-50		1950-51		1951-52	
	Number in Millions	Value in Rs. lakhs	Number in Millions	Value in Rs. lakhs	Number in Millions	Value Rs. lakhs
G. L. S.	5·93	44·66	0·536	6·93	0·583	7·35
Bulbs for torches	20·52	21·15	15·84	11·82	21·05	27·02
Bulbs for automobiles	1·01	4·52	0·82	4·41	9·92	32·04
Other sorts of electric lamps	11·61	169·57	1·82	27·87	0·58	16·48

Statistics of export are not available but the export of electric lamps must have been confined to Pakistan and the quantities cannot have been appreciable.

(e) *Estimated consumption and requirements.*—There is divergence of opinion on estimates of present and future demand. The present requirements of ordinary lamps have been estimated at 20 millions by the Development Wing of the Ministry of Commerce and Industry. Actual consumption as represented by the sum of indigenous production and imports in 1950-51 was only 14·68 millions as against 19·91 millions in 1949-50 and 14·468 millions in 1948-49. The Tariff Board in its report on the Electric Brass Lamps Holders Industry (1950) estimated that the demand would increase to 20 millions by the end of 1952. Assuming that the rate of increase in the generation of electricity in the country would be the same during the period of the Plan as it is at present, it is estimated that the requirements of G. L. S. lamps would be of the order of 30 millions by 1955-56, as against consumption in 1950-51 estimated at 15 to 16 millions.

II. Problems of the Industry

The difficulties faced by the industry relate to the procurement of raw materials and the inability of the industry to work to full capacity.

It has been pointed out earlier that the industry is almost entirely dependent on foreign countries for the supply of most of the important raw materials and components. In view of the general scarcity conditions throughout the world and the consequent difficulties in obtaining raw materials, it is essential that the lamp industry should be supported by the establishment of feeder ancillary industries for the manufacture of brass caps, glass tubes and rods, basing cement, etc., so that the industry may stand on its own legs. That efforts in this direction are being made by a few manufacturers is encouraging and their attempts should be supported by the Government. The manufacture of certain items of raw materials such as tungsten wire, molybdenum wire, leading-in wire, etc., cannot, however, be visualised at present. The Government should, therefore, render all assistance to the industry in procuring these materials to meet their requirements.

Although considerable surplus capacity for the manufacture of electric lamps exists at the present level of demand, the industry should be enabled to achieve as high a rate of production as possible. This could be achieved not only by providing necessary facilities for the import of raw materials, but also by restricting to the minimum the import of the

types of lamps already being produced in the country. In framing the import policy, cognizance has to be taken of the new types of lamps that are already being produced in the country.

III. Programme of Development

(a) *Existing Programme.*—Installation of new and expansion of existing plants are being undertaken by a few manufacturers some of which are expected to be completed by 1952-53. These projects envisage also the production of some of the components like brass caps, glass tubings and rods. These projects are as under:—

(i) As already stated, the factory of Messrs. Osler Electric Lamp Manufacturing Co. in Bombay has commenced production. Its rated capacity which is 3 million electric lamps at present is envisaged to increase in due course to 5 million pieces.

(ii) Messrs. Madras Electric Industries, Madras, have plans to establish a factory with an annual capacity of about 1·5 million pieces, but it is not known what progress has so far been made with this project.

(iii) Hind Lamps Ltd. (formerly Radio Lamp Works, Shikohabad), under a link-up scheme with a group of foreign manufacturers have planned the production of an additional 3 million electric lamps. They also envisage the production of components such as brass caps, glass tubing and rods. The investment on their project is estimated at about Rs. 40 lakhs. The expansion of production of electric lamps and glass shells and the manufacture of brass caps will materialise in 1952-53 while the scheme for manufacture of glass tubing and rods is expected to be completed by 1954-55.

(iv) Messrs. Pradip Lamp Works have plans to step up the production of miniature lamps to 6 million per year. This scheme is expected to be completed by 1953.

(v) The East India Traders, New Delhi, are setting up a factory for the manufacture of miniature lamps with an output of 3 million units per annum. They are expected to go into production in 1952.

(vi) P. Saran & Co., Delhi, have also plans to set up a factory for the manufacture of 3 million auto lamps per annum.

(vii) Natvarlal S. Talati, Bombay, and Indus Export-Import, Bombay, also propose to establish factories for the manufacture of miniature lamps with an output of 3½ million and 3 million units per annum respectively.

(viii) Electric Lamp Mfg. (India) Ltd., Calcutta, are setting up a factory for the manufacture of fluorescent tubes with a projected capacity of 400,000 numbers per annum. Production is expected to commence in 1952.

In addition, the Mysore Lamp Works, the Bengal Lamp Works and the Bharat Lamp Works are also reported to have schemes for producing miniature lamps within a year or so. The total capacity that will be brought into existence when these schemes are implemented will be of the order of 9 million pieces.

The implementation of the above projects would raise the annual capacity for production of G. L. S. lamps to 32·5 million by 1952-53 and that for miniature and special lamps to 27·5 million by 1955-56. The capacity for production of miniature lamps thus brought into existence will be able to take care of the requirements of this type of lamp.

(b) *Recommendations.*—The following recommendations are made for the planned development of the industry:—

(i) In view of the fact that the installed capacity for G. L. S. lamps would go up to 32·5 millions by 1952-53 as against an estimated demand of 30·0 millions by 1955-56, further expansion of this section of the industry is not considered necessary. Similarly, there is no need for additional capacity in case of miniature lamps, unless some of the schemes under consideration fail to materialise.

(ii) Schemes for the manufacture of the components of the industry and of special types of products, not being manufactured at present, should be encouraged.

The table given below summarises the progress of development of the electric lamp industry during the period of the Plan:—

		1950-51	1955-56
G. L. S. lamps			
Number of units		10	12
Annual rated capacity	Million Numbers	23	32·5
Production	,,	15·0	30·0
Estimated requirements	,,	16·0	30·0
Miniature lamps			
Number of units		1	8*
Annual rated capacity	Million Numbers	0·9	27·5
Production	,,	*N. A.*	16·0

*Some of them produce G. L. S. lamps also.

N.A.—Not available.

19. ELECTRIC MOTORS

Electric motors have an almost unlimited field in both industry and agriculture as they provide the motive power for driving all types of machines. In practically all factories, ranging from flour mills and oil mills to textile mills and heavy engineering workshops, electric motors are extensively used. Electric motors are also widely used for working agricultural pumps and play a considerable part in helping to grow more food. Electric motors are thus of considerable importance in both agriculture and indsutry.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—The electric motors industry came into existence in this country during the war. Consequent on the stoppage of imports during the war, a few large factories were started for the manufacture of electric motors. Messrs. P. S. G. and Sons, Coimbatore, are a pioneer in this line. Soon after, Messrs. Kirloskar Brothers also started the manufacture of motors. Several new companies also entered the field so that the industry is now fairly extensive.

There are several types of electric motors depending on the kind of use to which the motor is put and the nature of the electricity available, that is, whether it is Direct or Alternating Current. D. C. motors are essentially three types: shunt wound, series wound or compound wound. The most widely used A. C. motors are the induction type (squirrel cage or slipring), the synchronous type, variable speed or commutator type and single phase fractional horse power and small motors. Of the above types of motors, only the alternating current 3-phase squirrel cage and slipring types of electric motors up to 75 H. P. are being regularly manufactured in India on an organised scale. One manufacturer has recently extended the range of production up to 100 H. P.

At the beginning of the period of the Plan, there were 10 firms on the active list of the Development Wing of the Ministry of Commerce and Industry engaged in regular manufacture of electric motors. They had an installed capacity of 149,500 H. P. per annum. Messrs. Motor Machinery Manufacturers Ltd., Calcutta, who were then completing their plans and had manufactured a few prototypes have since gone into production in the middle of 1951 and there are at present 12 factories engaged in the manufacture of electric motors. Three of them with an annual rated capacity of 81,000 H. P. are located in Bombay and five factories with an annual rated capacity of 66,000 H. P. are situated in Calcutta. The remaining four are in Bangalore, Coimbatore and Baroda and have between them an annual installed capacity of 53,000 H. P.. bringing the total installed capacity of the industry to 200,000 H. P. per annum.

The actual production during the last three years has, however, been considerably below capacity, although it has shown a steady upward trend. Whereas nearly 13,500 electric motors with a total rated power of 60,000 H. P., valued at about Rs. 44·5 lakhs and 13,100 electric motors of 73,000 H. P. valued at about Rs. 46 lakhs were manufactured in 1948 and 1949, production went up in 1950 to 14,800 electric motors rated at 82,000 H. P. and valued at about Rs. 52 lakhs. The production in 1951 was as high as 142,000 H. P.

(b) *Capital and labour.*—The total number of persons employed in the electric motor industry is estimated at about 1,600. Since many motor manufacturers produce, apart from motors, electric transformers and fans, it is not possible to give an accurate estimate of the capital invested in the electric motor industry.

(c) *Raw materials.*—A large variety of raw materials are required in the electric motor industry. It has been estimated that the cost of raw materials amounts roughly to 50 per cent. of the cost of production. The chief raw materials consist of copper conductors, insulated copper wires, cables and flexibles, electrical steel sheets and stampings, and insulating materials like micanite and mica cloth, leatheroid, empire cloth and tape, cotton tape, insulating varnishes, etc., pig iron, mild steel plates, sheets, etc., painting materials and other components, such as, ball and roller bearings, bolts, screws, terminals, etc. Many of the important raw materials like copper wires, leatheroid, micanite and mica cloth, empire cloth and tape and ball and roller bearings have to be imported. The total value of raw materials required for the manufacture of 200,000 H. P. motors at the present level of prices has been estimated at about Rs. 70 lakhs. Of these, imported materials cost roughly 60 per cent. The dependence of the industry on imports for some of its vital raw materials has been one of its serious handicaps. Particularly during recent years considerable difficulty has been experienced in procuring such essential materials as copper wire and insulating materials. Some of the raw materials like micanite, empire cloth and leatheroid which are at present imported could be produced in the country. There is also the possibility of meeting the requirements of ball bearings from domestic sources with the expansion of production by the National Bearing Co. Ltd. Electrical steel sheet which is essential for the manufacture of motors as well as transformers is not produced in the country in sufficient quantity. Production of electrical steel sheets in 1951 for all purposes was 4,298 tons as against 1,600 tons required for the production of 150,000 H. P. motors alone. The production of these raw materials and components has to be developed and the Government should discuss this matter with the industry.

(d) *Imports and exports.*—There has been restriction on imports of A. C. 3-phase squirrel cage and slipring motors up to 30 H. P. during the last two years but all other types of motors were allowed to be imported. The total value of electric motors of all types imported in 1948-49, 1949-50, 1950-51 and 1951-52 was of the order of Rs. 314 lakhs, Rs. 252 lakhs, Rs. 127 lakhs and Rs. 112 lakhs respectively. Subject to availability of an adequate quantity of raw materials to step up the production of indigenous manufacturers, the possibility of extending the present protection given to motors up to 30 H. P. to a higher limit of 75 H. P. should be considered by the Government after an inquiry by the Tariff Commission so as to enable the indigenous industry to raise its rate of production and expand the range of manufacture.

The quantity and value of electric motors exported are not known. Electric motors have, however, not been exported in any appreciable quantity.

(e) *Estimated consumption and requirements.*—It has been estimated that the demand for electric motors between 1 and 50 H. P. was of the order of 200,000 H. P. by 1950. In view of the industrial expansion envisaged, the future demand for motors is expected to expand considerably. The total requirements of A. C. 3-phase squirrel cage and slipring induction types of motors up to 50 H. P. are estimated to increase to about 320,000 H. P. by 1956, assuming that the generation of electricity in the country will increase at the same rate as at present and that industrial activity will also keep pace with it.

II. Problems of the Industry

The main problem of the industry, as already pointed out, is the shortage of some of the essential raw materials. Among indigenous raw materials, pig iron and steel are

in short supply and the motor manufacturers experience difficulty in obtaining them. In addition, many imported raw materials, particularly copper wire and insulating materials, are also in short supply. It is, therefore, necessary to encourage the production of some of the essential raw materials and semi-finished components in the country so as to make the industry self-sufficient as far as possible. Restrictions on imports of electric motors such as are already manufactured in the country might also be required in order to enable the industry to withstand foreign competition. Such restrictions would help the industry to overcome the prejudice which is still in evidence in the minds of consumers against indigenous motors.

III. Programme of Development

(a) *Existing programme.*—A few manufacturers have under implementation schemes to produce electric motors of a higher power range and of special types. Reference has been made earlier to Messrs. Motor and Machinery Manufacturers Ltd., Calcutta, whose plant has an annual installed capacity of 3,000 H. P. Other schemes are as follows:—

(i) Messrs. Kirloskar Electric Co. Ltd., Bangalore who are in technical collaboration with Messrs. Brush Engineering Co., of the U. K., have by now extended the range of production of motors from 50 H. P. to 100 H. P. The firm has already successfully manufactured a few motors of 100 H. P. and is on its way to regular production of these motors. It has also plans to take up the manufacture of motors above 100 H. P. and expects to increase the capacity from its present level to 75,000 H. P. per annum per shift in due course. This is expected to cost Rs. 9,75,000, including working capital, during the period of the Plan.

(ii) Messrs. Associated Electrical Industries Manufacturing Co. Ltd., and Messrs. G. E. C. (India) Ltd., have plans to extend their range and capacity of production up to 100 and 50 H. P. respectively. In addition Messrs. Crompton Parkinson Works Ltd., Messrs. Bharat Bijlee, Messrs. National Electrical Industries Ltd., Messrs. Kirloskar Electric Co. Ltd., Messrs. G. E. C. (India) Ltd. and Messrs. Electric Construction Equipment Co. Ltd. have taken up the manufacture of special types of electric motors required for the textile industry. Messrs. Jyoti Ltd., Baroda, and Messrs. Kirloskar Electric Co. Ltd., are also manufacturing vertical spindle motors for deep well pumps.

(b) *Recommendations.*—(i) As a result of the implementation of the above projects in the private sector, the total installed capacity is expected to be about 300,000 H. P. per annum by 1955-56. Compared to the demand which is expected to be 320,000 H. P. per annum by 1955-56, the production capacity would be short by about 20,000 H. P. per annum. This difference between future production and demand could, however, be narrowed considerably if some of the units could work for two shifts instead of one as at present. To fill the gap between the estimated demand and indigenous production which might still exist in certain categories, it would be desirable to encourage the existing manufacturers to step up the production of motors up to 100 H. P. by expansion and diversification of the lines of manufacture. If the requirements are not met even then, it might be necessary to consider measures for the creation of additional capacity in the country as a rational solution of the problem. In this connection an accurate assessment of requirements should be attempted early with the assistance of the Tariff Commission and re-organisation of import statistics taken in hand.

(ii) The Government should foster the production of raw materials like micanite, empire cloth, leatheroid, etc., within the country and render assistance to the industry in procuring other raw materials and components from abroad.

(iii) With a view to encouraging the indigenous industry, the import of those types of motors which are already being produced in the country should be restricted to the minimum.

The table below summarises the programme of development of the electric motor industry during the period of the Plan:—

		1950-51	1955-56
Number of units		10	12
Annual rated capacity	'000 H.P.	149·5	300·0
Actual production	'000 H.P.	99·0	320·0
Estimated requirements	'000 H.P.	200·0	320·0

20. ELECTRIC TRANSFORMERS

Electric transformers, both power and distribution types, are necessary wherever alternating currents have to be generated, transmitted and distributed. It is considerably cheaper to transmit power over long distances at high voltages because the quantity of conducting material required to transmit power is lower at higher voltages. It becomes, therefore, necessary to step up the voltage at the generating station through power transformers. In actual use, however, electricity is rarely required above 220 or 440 voltages so that at the distribution end, the power has to be stepped down to a lower voltage. Economics of power generation and transmission demand the large-scale adoption of transformers for transmission and distribution of electric power.

I. Brief Survey of the Industry

The manufacture of transformers existed in India only on a small-scale before the war. The only pre-war producer of transformers was the Government Electric Factory, Bangalore, which started production in 1936-37. After the outbreak of the war, the production of transformers expanded considerably. The Associated Electrical Industries Manufacturing Co., Calcutta, and the Crompton Parkinson Works, Bombay, came into production in 1941 and 1943 respectively. Four other manufacturers, *viz.*, National Electrical Industries Ltd., Bombay, Radio Lamp Works Ltd., Bombay, Radio Electricals Ltd., Madras, and Electric Construction and Equipment Co. Ltd., Calcutta, have since been established.

(a) *Location, rated capacity and production.*—There were seven units engaged in the manufacture of electric transformers in the beginning of 1951. According to the assessment made by the Tariff Commission in the course of its enquiry into the claim of the Electric Transformer Industry for protection in June 1952, the rated capacity has been assessed as 370,000 KVA per annum on the basis of a single eight-hour shift and 300 working days per annum. The industry is predominantly concentrated in Bombay where there are three units with a total capacity of 192,000 KVA per annum. The two units in the Calcutta area have a combined rated capacity of 108,000 KVA per annum and the remaining two units account for the balance of 70,000 KVA.

The types of transformers which were being manufactured until 1951 were of a comparatively low rating, *viz.*, 1,000 KVA and 22 KV on the high tension side. Recently factories have commenced manufacture of 33 KV transformers and have extended the range to 2,500 KVA. The actual production of transformers during recent years has shown steady increase, although it is far below the installed capacity. The bulk of production has so far been in the form of 3-phase transformers up to 11 KV. Actual production of 3-phase transformers of different rating since 1949 was, according to the Tariff Commission as under:—

Actual Production of 3-phase transformers in different KV ranges and KVA ratings

	1949		1950		1951		1952 (Jan.-Apl.)	
	Number	KVA	Number	KVA	Number	KVA	Number	KVA
Up to 3·3 KV . .	169	15,831	268	17,301	313	23,300	92	7,463
Above 3·3 KV to 6·6 KV	117	21,271	167	43,460	252	53,791	124	20,085
Above 6·6 KV to 11 KV	588	38,190	793	86,035	1,317	95,473	510	35,188
TOTAL up to 11 KV .	874	75,292	1,228	146,796	1,882	172,564	726	62,736

Actual Production of 3-phase transformers in different KV ranges and KVA ratings—contd.

	1949		1950		1951		1952 (Jan.-Apl.)	
	Number	KVA	Number	KVA	Number	KVA	Number	KVA
22 KV								
Up to 25 KVA . .	7	175	10	250	..	..	..	..
Above 25 to 75 KVA .	76	4,725	20	1,185	10	500	11	800
Above 75 to 250 KVA	22	2,650	15	1,700	20	2,350	11	1,200
Above 50 to 500 KVA	2	1,000	1	500	7	2,900	1	300
Above 00 to 1,000 KVA	1	1,000	3	2,750	4	3,100	..	..
Above 1,000 to 1,500	..	..	..	..	1	1,250	..	..
33 KV								
Above 75 to 250 KVA	..	..	..	..	2	500	..	..
GRAND TOTAL .	982	84,842	1,277	153,181	1,926	183,164	749	65,036

(b) *Capital and labour.*—The amount of capital invested in this industry is not known. The firms manufacturing transformers are also engaged in the manufacture of certain other electric goods like motors, fans, etc., so that it is difficult to apportion the capital and labour employed in the manufacture of transformers. On a very rough estimate, the labour employed by the industry could be put at 1,200.

(c) *Raw materials.*—Like other engineering industries, the transformer industry also depends, to a large extent, on imported raw materials. The raw materials required in the transformer industry are essentially electrical steel sheets and laminations, insulated copper wires and strips, electrolytic copper bars and wires, mild steel plates, sheets, strips, rods, etc., iron castings, non-ferrous metals like brass and aluminium, insulating varnish and other insulating materials, such as, vulcanised fibre sheets and boards, synthetic resin bonded sheets and tubes, varnished cambric tapes, transformer oil, etc. Of these, part of the requirements of electrical steel sheets, mild steel plates and insulated copper wires is met indigenously. The total quantity of electrical steel sheets and laminations required for working the industry to full capacity of 370,000 KVA is estimated at 2,000 tons per annum. The Tata Iron and Steel Co. are the only indigenous producer of this type of steel and the requirements can be met only partially from this source. Steel tubes for cooling, insulating materials, transformer oil, copper wires and strips, etc., have to be imported. The imported raw materials account for about 53 per cent. of the total value of raw materials.

(d) *Imports and exports.*—The imports of electric transformers up to 1,500 KVA and 22 KV on the H. T. side are restricted at present. Transformers of higher ratings are allowed to established importers at 100 per cent. of their best year's import. The number and type of transformers imported are not shown in the Sea-borne Trade Accounts, but the value of such imports in 1948-49, 1949-50 and 1950-51 was approximately about Rs. 109·9 lakhs, Rs. 141·4 lakhs and Rs. 150·5 lakhs respectively. Imports in 1951-52 came to Rs. 144·5 lakhs.

The quantity of transformers exported is not known; it is, however, unlikely that transformers have been exported to any great extent. There is, however, sufficient scope for

developing an export market in South East Asian countries, in which schemes of power development are being envisaged. The extent of such export would depend on the ability of the industry to manufacture high quality products at prices comparable to those of other competing nations.

(e) *Estimated consumption and requirements.*—Since the imports of transformers up to 1,500 KVA and 22 KV are restricted and there are no scarcity conditions visible, it can be presumed that the indigenous production is nearly sufficient to meet the requirements of this type of transformer. The requirements of transformers in this category could be placed at 225,000 KVA per annum at the present time. There is, however, considerable demand for the higher range of transformers as is indicated by the large imports during the last three years. In view of the number of power projects which have been undertaken, the demand for transformers is bound to go up considerably in the future. It has, however, been found difficult to make an accurate year-wise assessment of this demand during the period of the Plan. In the course of its enquiry into the claim of the electric transformer industry for protection, the question of future demand for transformers was discussed by the Tariff Commission in considerable detail with all the interests concerned and also with the Central Water and Power Commission. It has been estimated that the requirements of power and distribution transformers up to 33 KV would be 2·65 million KVA during the quinquennium ending 1955-56, on the basis of complete utilisation of the power from development programmes envisaged in the Five-Year Plan. But it is necessary to take into account the fact that there is usually a time lag between the installation of generating capacity and of transformer capacity. In the circumstance, the Tariff Commission felt that it would be difficult to arrive at an accurate assessment of requirements of power and distribution transformers over the five-year period. An assessment of future requirements has also to take into account the demand for replacements as well as the requirements of transformers by industrial undertakings generating their own power on which sufficient information is not available. Further, the annual requirements of transformers would vary considerably over the period of the Plan as these are closely correlated to the generation of power in each year.

Early steps should be taken to make an assessment of actual requirements so that additional capacity may in future be brought into existence on a planned basis.

II. Problems of the Industry

The difficulties faced by the industry relate to non-availability of raw materials. It has already been indicated that the industry is dependent, to a considerable extent, on imported raw materials. During recent years the progress of the industry was somewhat hampered, because of the short supply of materials, particularly high tension porcelain bushings, cooling tubes, etc. The delays in the grant of import licenses also sometimes caused difficulty to the industry in obtaining continuous supply of raw materials and components. The position has improved considerably in recent months but continuous watch would be necessary to ensure adequate and regular supplies for maintaining a high level of production. The Tata Iron and Steel Co., Jamshedpur, are the only manufacturers of electrical steel sheets but their production is not sufficient to meet the entire demand of the transformer industry in respect of electrical steel sheets and, therefore, imports of this grade of steel sheets have still to be allowed.

Another difficulty is with regard to the inequality of customs duty leviable on imported raw materials required for the manufacture of transformers and that charged on the imported

finished transformers. Owing to this tariff inequality the industry finds itself in a disadvantageous position and cannot compete with foreign manufacturers. The revenue duties on raw materials vary from 10 to 30 per cent. while that charged on the finished transformers is only 5 per cent. The manufacturers of transformers have represented that the duty on imports of raw materials should be reduced so that transformers could be produced more cheaply in the country. If a reduction of import duty is likely to contribute substantially towards bringing down the cost of production of transformers without, at the same time, having an adverse effect on ancillary industries manufacturing these raw materials within the country for meeting the requirements of a number of industries it should be possible to give the transformer industry some assistance by way of reduced import duties on the raw materials. Various issues bearing on this question are, at present, under examination by the Tariff Commission.

III. Programme of Development

(a) *Existing programme.*—The following schemes are envisaged to be carried out during the period of the Plan:—

(i) The Kirloskar Electric Co. Ltd. have a scheme to manufacture transformers of higher power range which includes the manufacture of transformers up to 5,000 KVA-33KV. They are in technical collaboration with the Brush Electrical Engineering Co. Ltd., Loughborough, who have agreed to furnish all the technical 'know-how' for the manufacture of transformers. To start with, the manufacturing programme would be confined to transformers from 50 to 500 KVA with an initial production of 50,000 KVA per annum. The range and capacity of production would be augmented after one year. The scheme is expected to cost about Rs. 11 lakhs inclusive of working capital.

(ii) The General Electric Co. of India Ltd., Calcutta, also have a scheme to extend their factory for the manufacture of transformers. The plant machines and test equipment which are being installed by them will enable them to produce transformers up to 2,500 KVA and 11 KV although the production in initial stages is expected to be confined to transformers of 250 KVA and less only. The annual rated capacity of the plant is expected to be 15,000 KVA during the period of the first Five-year Plan.

(iii) Radio and Electricals Ltd., Madras, have plans to expand the manufacture of transformers, but it is difficult at this stage on the basis of available information to state that they could achieve an increase of production by 70,000 KVA as claimed by the firm. A more realistic figure of an additional 20,000 KVA is assumed in this Plan.

(iv) In the public sector, the Government Electric Factory, Bangalore, have a scheme to expand the transformer section of the factory. The present transformer section has a capacity of about 50,000 KVA per annum. The scheme for the expansion of this section at an estimated cost of Rs. 10 lakhs envisages stepping up of the production by an additional 30,000 KVA with a sale value of Rs. 20 lakhs. The additional equipment that will have to be obtained is not likely to go into production before 1953 as the construction of the additional buildings and the installation of the machinery would take nearly two years.

(b) *Recommendations.*—(i) By the implementation of the projects mentioned above, the capacity of the transformer industry would amount to nearly 485,000 KVA per annum. Further the industry would be producing transformers of higher ratings whose production is negligible at present. During the period of the Plan attention should be concentrated on the fullest utilisation of the capacity that would come into existence, and improvement in the quality of transformers. If this is achieved, the requirements would be met substantially from the indigenous production.

(ii) The present structure of the tariff duties on the finished transformers and on the raw materials and components of transformers is being examined by the Tariff Commission and Government should give early effect to its recommendations so that the domestic capacity for transformers might be utilised fully during the period of the Plan.

(iii) Projects for producing the raw materials of the transformer industry with a view to curtailing the dependence on imports deserve to be encouraged by the Government. Further efforts should be directed towards improving the quality of some of these raw materials and components which are being now manufactured in the country, but are not up to the specifications of the transformer industry.

The following table summarises the programme of development of the electric transformer industry during the period of the Plan:--

		1950-51	1955-56
Number of units		7	9
Annual rated capacity	('000 KVA)	370·0	485·0
Actual production	('000 KVA)	178·9	450·0

21. RADIO RECEIVERS

Apart from providing a medium of international communication, radio and broadcasting play an important role in the educational, social and cultural development of a country. They are also playing an increasingly important role in the defence services, civil aviation and shipping. The future development of the indigenous industry will depend, to a very large extent, on three important factors, namely, availability of cheaper radio sets, increased availability of electric power and extension of broadcasting services in the country.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—The radio receiver industry in India is of recent origin and can be said to have started only in 1946, before which the country was entirely dependent upon imports. The production of dry battery receivers was started at the beginning of 1948. The total annual rated capacity of the entire industry, which was 8,000 radio sets in 1947, went up to 60,000 radio sets by 1949. Up to about the middle of 1950, there were 11 registered and organised units with an annual rated capacity of 77,200 radio sets but, later, 5 new units came into operation, while one factory stopped production. Thus, in June 1952, there were 15 organised units in the country and the total rated capacity on an eight-hour single shift basis for 300 days per annum is 153,100 radio sets. The radio receiver industry, as it exists in India today, is engaged primarily in the assembly of radio sets since the manufacture of a large number of the components which go to make a radio set, has not yet been taken up in the country on a large scale.

Some of the organised factories have developed in technical collaboration with foreign firms and the quality of the indigenous sets is considered as good as that of the imported sets.

One firm has in 1952 commenced the assembly of loud speakers.

The State-wise distribution of the radio receiver industry in 1952 is given below:—

State-wise distribution of the radio receiver industry

States	Number of units	Annual rated capacity (Tons)
West Bengal	4	43,000
Bombay	4	75,600
Mysore	1	18,000
Bihar	1	7,000
Delhi	1	2,500
Madras	1	1,000
Punjab and PEPSU	3	6,000
TOTAL	15	153,100

In addition to the 15 organised units which are on the list of the Development Wing, Ministry of Commerce and Industry, assembly of radio sets is also being carried out by a large number of unregistered individual firms and technicians on a small scale as well as on a cottage industry basis.

The actual production of the organised industry which was of the order of about 20,582 radio sets, including dry battery sets, during 1948-49 and 21,910 during 1949-50, increased to 49,053 radio sets during 1950-51 and 103,023 in 1951-52. It is estimated that a little less than 25 per cent. of the actual production was confined to dry battery sets.

(b) *Capital and labour.*—Information regarding the capital invested is not available. Precise information regarding the number of workers employed in the industry is also not known but it is estimated that about 1,200 to 1,500 skilled labourers are employed in the industry.

(c) *Raw materials.*—Strictly speaking, the indigenous radio receiver industry is an assembly industry since nearly 90 per cent. of the principal components and raw materials required, in terms of value, have to be imported, mostly from the U. K., the U. S. A., and Holland. The principal components and raw materials which have to be imported are radio valves, enamelled copper wires, insulating materials, condensers, loud speakers, litz wires, resisters, etc. Among the different components being manufactured in the country, although on a small scale, are wooden cabinets, metal parts, knobs, paper and mica condensers, transformers, chokes, coils, resisters, P. V. C. sleeving, panels, valve-holders, pilot lamps, plugs, tags and grommets. Steel for the fabrication of metal parts, such as chassis, plates, screws, nuts, bolts, spindles, etc., is available from indigenous sources. Dry batteries for the battery sets are being manufactured within the country.

(d) *Imports and exports.*—Until 1946, the country was dependent entirely on imports of radio sets. On an average, nearly 88,840 radio sets (valued at about Rs. 27·0 lakhs) were imported annually during the two years preceding the last war. The imports went up to 52,416 radio sets (Rs. 41·7 lakhs) during 1941-42 but, subsequently, went down to 895 (Rs. 1·5 lakhs) during 1944-45. The largest imports were recorded in 1947-48, when they went up to 192,172 (Rs. 2,88·4 lakhs) radio sets, indicating a pent-up demand.

In addition to complete radio sets, a large quantity of radio valves and other component parts are also imported every year; the relevant statistics for the last four years are given below:—

Imports of radio receivers and parts

(*Value in Rs.'000*)

	1948-49		1949-50		1950-51		1951-52	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1. Wireless Receivers (Nos.) (Complete)	42,443	76,98	43,355	71,66	16,012	25,44	29,121	52,64
2. Wireless Valves (Nos.)	317,892	8,39	248,939	8,33	542,723	13,67	799,733	22,64
3. Parts of Wireless Receivers.								
(i) Component parts.	..	32,89	..	62,57	..	72,02	..	1,16,62
(ii) Others . .	..	7,97	..	7,10	..	25,26	..	15,00
TOTAL (Value) .	..	1,26,23	..	1,49,66	..	1,36,39	..	2,06,90

There are no exports of radio receivers from India at present.

(e) *Estimated consumption and requirements.*—The total quantity available for consumption, comprising indigenous output and imports, was of the order of 63,025 radio sets during 1948-49, 65,265 during 1949-50, 65,065 during 1950-51 and 132,143 during 1951-52. On the other hand, the total number of licences for radio sets in force increased

from 507,324 in December 1950 to 635,026 in December 1951, indicating an increase of 127,702 licences over the previous year. The difference between the quantity available for consumption and the increase in the number of licences is presumably explained by the fact that figures of indigenous output are confined to production of organised units only as also by the fact that licensing of radio sets was made more strict in 1951. It is not known exactly what proportion of the total number of licences in force may be taken to indicate dry battery radio sets in use, but it may be assumed that dry battery sets in operation would be slightly less than 25 per cent. of the total number of radio sets. Accordingly, the total number of dry battery radio sets in operation at the end of 1951 may be estimated at about 150,000.

The demand for radio sets, as already mentioned, depends on several factors, such as the cost of sets, the availability of electric power and the extension and quality of broadcasting services. It is, therefore, difficult to anticipate the likely increase in the demand during the next five years. On the basis of the current rate of increase of licences, namely, 100,585 per annum, the total number of licenses should increase to about 1·125 million by about 1955-56. But there are various factors which may accelerate the rate of increase. All-India Radio (A. I. R.) contemplates the extension of broadcasting services to certain areas of Part 'B' States, especially Rajasthan, Madhya Bharat and Saurashtra, which have hitherto been without any such service. The future demand for radio receivers will also be influenced by the extension of rural broadcasting services and the establishment of community sets by Government, particularly under the Indo-American Technical Co-operation Programme. About 1,000 community receivers were installed in the country during 1951-52, which brings up the total number of such receivers to about 4,600. Besides, a Liaison Committee has been set up recently at the Headquarters of the A. I. R. with a view to popularising broadcasting and expanding its use. As a result of these developments and assuming that there will be increased availability of comparatively cheap radio sets and electric power, the demand for radio sets is expected to increase considerably and it is estimated that the total number of licences will rise to about 1·8 million by 1955-56. The rate of increase may not, however, be uniform during the next five years. It is likely to be relatively slow during the next two or three years, but subsequently to be considerably accelerated and to reach the figure of about 350,000 per annum by the end of five years. Out of about 1·8 million radio receivers expected to be in operation by the end of 1955-56, about 25 per cent. (or 450,000) may be assumed to be dry battery receivers.

II. **Problems of the Industry**

The indigenous radio receiver industry, being dependent largely on imports of certain raw materials and components, is finding difficulty in lowering the prices of its product and, thereby, encouraging their off-take in the country. In this connection, it is necessary to point out that the manufacture of the necessary components on an economic basis is possible only when their off-take is very much higher than at present. Accordingly, even in countries like the U. K., the U. S. A., as well as Continental Countries, radio manufacturers generally purchase their requirements of the necessary components from specialists in the line and concentrate mainly on evolving new circuits, designs and models. In India, there is at present a very limited scope for the manufacture of the various components on a larger scale mainly because of the meagre demand for radio receivers.

However, a few of the existing assemblers have already started the manufacture of some of the components and efforts to produce a larger number, especially loud speakers,

electrolytic condensers, gang condensers, volume controls, carbon resistances, I. F. transformers, valve-holders and moulded radio cabinets should be encouraged by facilitating imports of the necessary raw materials. In the meanwhile, anomalies or disparities in the duties on imports of radio components and raw materials as compared to complete radio receivers should be carefully examined so as to facilitate the import of specific components which cannot be economically manufactured within the country and eventually, bring down the prices of indigenous radio receivers. Moreover, the import policy in respect of complete radio sets should also be so formulated as to encourage the establishment of a full-fledged industry.

Another difficulty in the way of the healthy development of this industry is the multiplication of small and unorganised assemblers of radio sets in the country. Radio assembling is a specialised industry, calling for the services of highly technical personnel. It is till in its infant stage and a haphazard growth of small assemblers is not likely to contribute to improving the quality of the radio sets produced. While it is difficult to put an end to the assembling of radios on a small scale and cottage basis, it is desirable that the licencing of radio assemblers should be introduced and licences issued only to those factories which have got the necessary plant and equipment, especially testing facilities and technical personnel, to produce radio sets according to specified standards which are being laid down by the Indian Standards Institution.

III. Programme of Development

(a) *Existing programme.*—While Messrs. Gramophone (H. M. V.) Co. Ltd., Calcutta, have gone into regular production early in 1952, five existing units, namely, Messrs. Murphy Radio of India, Messrs. National Ecko Radio and Electrical Manufacturing Co., Messrs. General Electric Co., Messrs. Radio Electrical Manufacturing Co., and Messrs. Tesla (India) Radio Manufacturing Co., have plans to expand the existing capacity of their plants and to start the manufacture of certain radio components which have not hitherto been produced in the country. There is also a proposal to start the production of 5,000 radio sets in the Government Precision Instrument Factory in Uttar Pradesh. However, in view of the fact that the installed capacity of the indigenous industry if worked two shifts is of the order of 300,000 radio sets per annum and that it has plans to expand its capacity steadily to meet the growth of requirements, it is not necessary for the Government to take up the production of radio sets.

Some of the leading producers have plans under consideration for the manufacture of loud speakers, gramophone pick-ups, volume and tone controls, different types of condensers and resisters and plastic moulded cabinets. None of these schemes, however, have yet assumed a concrete form.

(b) *Recommendations.*—(i) The existing units should be given necessary facilities to expand their capacity and installation of additional units is not necessary during the next five years.

(ii) The disparity in the existing rates of duty on imports of radio components and raw materials on the one hand and on complete radio sets on the other, should be examined so as to remove anomalies and reduce the cost of components and raw materials which cannot be economically manufactured in the country.

(iii) Imports of radio sets should be regulated in the light of the production programme of the indigenous industry and the future requirements, after referring the case to the Tariff Commission, if necessary.

(iv) Licensing of radio assemblers should be introduced in the country and radio sets produced should be in accordance with the standards which are being formulated by the Indian Standards Institution.

The table below summarises the programme of development of the organised radio receiver industry during the period of the Plan:—

	Unit	1950-51	1955-56
Number of factories		11	15
Annual rated capacity	Numbers	77,200	380,000
Actual production	,,	49,053	350,000

D. Chemical and Allied Industries

22. FERTILISERS

The application of adequate quantities of fertilisers to soils is essential not only for stepping up agricultural production but also for maintaining soil fertility and preventing soil erosion. Although Indian soils which are deficient in humus require the application of organic fertilisers, it is also necessary to supply sufficient quantities of the principal inorganic fertiliser constituents, namely nitrogen, phosphorus and potash.

Nitrogen may be supplied along with organic matter in the form of cattle-shed manure, town refuse, sewage, waste organic material and oilcake. Although there is considerable scope for meeting the requirements of nitrogen in these forms to an increasing extent in India, both tradition and difficulties of collection and transport have impeded their large-scale utilisation. It has also been repeatedly suggested that in addition to gradually increasing the supplies of manures in this form, it is necessary to take to the application of synthetic nitrogenous fertilisers for maintaining soil fertility and increasing agricultural production.

Application of phosphatic fertilisers is considered even more important than nitrogenous fertilisers. Phosphorus not only helps to keep the soil fertile, but also prevents soil erosion by fostering the growth of a good plant coverage. The quantity of phosphatic fertilisers reckoned in terms of the active constituent (P_2O_5) applied in the world today far exceeds the quantity of nitrogen used for fertiliser purposes. Unfortunately in India, the position is otherwise. While the benefits of utilisation of nitrogen in the form of ammonium sulphate have already received wide publicity in recent years and the results being spectacular, the demand for ammonium sulphate is increasing, the consumption of phosphatic fertilisers, the more essential of the two, is still extremely small.

Fortunately, none of the major crops in India require the application of potash and our requirements are mainly confined to tobacco, cocoanut and fruit trees. In some places, sugarcane may also require some application of potash. Generally potash fertilisers are applied in combination with nitrogenous and phosphatic fertilisers after adjustment of the composition of the mixture to correspond to definite proportions of K, P and N.

The development of this important industry is dealt with in three sections relating to Nitrogenous, Phosphatic and Potash Fertilisers.

NITROGENOUS FERTILISERS

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—So far in India the inorganic nitrogenous fertiliser almost universally employed has been ammonium sulphate. Although the bulk of the quantity consumed has been imported, production of ammonium sulphate in India was first achieved as a by-product of coking ovens and there are at present four such units in West Bengal and Bihar with a rated capacity of about 26,000 tons of ammonium sulphate per annum. Synthetic ammonia production and its conversion to ammonium sulphate was first started in Mysore in the year 1938 in a plant established at Belagula with

a rated capacity of 6,600 tons of ammonium sulphate per annum. Only recently in 1947 a larger plant with a rated capacity of 46,000 tons of ammonium sulphate per annum was put up near Alwaye in Travancore, the synthetic ammonia manufactured being converted into the sulphate partly by the use of gypsum and partly by reaction with sulphuric acid produced from sulphur.

On the basis of the recommendation made by the Food Grains Policy Committee in 1943 that it was necessary to undertake large-scale manufacture of nitrogenous fertilisers in India for stepping up food production, it was decided in 1945 to put up a Government factory at Sindri in Bihar for manufacturing 350,000 tons of ammonium sulphate per annum using the gypsum process. Arrangements for the design and construction of this factory were taken in hand during 1947 and the work was completed before the end of 1951. The factory went into production in October 1951, and it is expected to reach fuller production by about the end of 1952. With the coming into production of the Government factory at Sindri, the rated capacity in the country for inorganic nitrogenous fertilisers has reached 428,670 tons of ammonium sulphate per annum on the basis of 330 working days.

The production of ammonium sulphate has shown a steady increase during the last three years. The actual production during 1949, 1950 and 1951 came to 45,395 tons, 47,308 tons and 52,705 tons respectively. There was a substantial increase in January-May 1952 when production reached 63,692 tons.

(b) *Capital.*—The capital invested in the by-product ammonium sulphate plants which form part of the coke ovens is not known. A sum of Rs. 370 lakhs had been invested in the units belonging to the Mysore Chemicals and Fertilisers and the Fertilisers and Chemicals (Travancore) Ltd. (FACT Ltd.). The State Government of Mysore has invested Rs. 9 lakhs in the Belagula plant (Rs. 2 lakhs as share capital and Rs. 7 lakhs as loan) and fostered its development by supply of electric power at a concessional rate of 0·125 annas per KWhr. The State Governments of Madras and Travancore have participated in the capital investment of the Alwaye plant, and their share in the paid-up capital comes to Rs. 257 lakhs. These two synthetic fertiliser factories would not have come into existence but for the support and active assistance—financial and otherwise—which they received from the State Governments.

A sum of Rs. 18·41 crores had been spent up to the end of March 1951 on the Fertiliser Factory under construction at Sindri. A further expenditure of Rs. 3·68 crores was incurred in 1951-52 and the Central Government have provided for a loan of Rs. 3·0 crores to the Sindri Fertilisers and Chemicals Ltd. in the budget for 1952-53.

(c) *Raw materials.*—The manufacture of ammonium sulphate consists of two distinct operations, *viz.*, synthesis of ammonia and conversion of ammonia into ammonium sulphate. The synthesis of ammonia requires hydrogen and nitrogen which are produced by different processes depending on the availability of raw materials. Electrolysis of water is adopted for generation of hydrogen wherever cheap power is available and the plant at Belagula has adopted this process. Similarly, conversion of ammonia into ammonium sulphate can be achieved with the help of sulphuric acid or alternatively, through the use of gypsum. The raw materials required depend, therefore, on the process adopted for the manufacture of ammonia and its conversion to ammonium sulphate. Taking into consideration the process adopted by the Mysore Chemicals and Fertilisers Ltd. and FACT Ltd. as well as

ammonium sulphate derived from the coke ovens, the requirements of the principal raw materials in 1950-51 were estimated at 28,870 tons of sulphuric acid and 10,700 tons of gypsum. FACT Ltd. uses waste wood for the production of the gas mixture for ammonia synthesis and the Alwaye plant is the first of its kind for using wood directly for gasification.

(d) *Imports and exports*.—There have been considerable imports of ammonium sulphate and other nitrogenous fertilisers during recent years. While in 1948-49 and 1949-50, nearly 133,000 and 170,000 tons of ammonium sulphate were imported, this figure rose to 370,000 tons in 1950-51 and came down to 67,380 tons in 1951-52. In addition, substantial quantities of sodium nitrate and other nitrogenous fertilisers were also imported. Efforts are also being made to import limited quantities of other fertilisers such as ammonium nitrate, urea, etc., whose manufacture in India requires to be properly developed, so as to get them introduced in the country and to familiarise agriculturists with their use and methods of application. The programme for 1952 under the T. C. P. has provided for the import of 1,000 tons of urea (44 per cent. N); 1,000 tons of nitrophosphate (20 per cent. N and 20 per cent. P_2O_5); 4,000 tons of triple superphosphate, granular (46 per cent. P_2O_5); 4,000 tons of ammonium phosphate, granular (10 per cent. N and 48 per cent. P_2O_5); 10,000 tons of ammonium nitrate, prilled (33 per cent. N) and 88,000 tons of ammonium sulphate (20·5 per cent. N). The supplies of nitrogenous fertilisers to different countries were carefully regulated from the World Nitrogen Pool both during and immediately after the war years. Subsequently, however, it has been possible to make direct negotiations with other countries and obtain increasing quantities of fertilisers.

Exports of nitrogenous fertilisers are small and are mainly in the form of organic manures rather than synthetic fertilisers.

(e) *Estimated consumption and requirements*.—Assuming that nitrogenous fertilisers are applied on a country-wide basis over all soils and for all crops, the annual requirements in the form of ammonium sulphate have been estimated at different times to be from 12 to 13 million tons. The recent estimates given by the Ministry of Agriculture are also of the order of 2 million tons of nitrogen equivalent to nearly 10 million tons of ammonium sulphate. Considering, however, the still insurmountable difficulties to be overcome before such a wide scale application could be secured, and on the basis of restricting the use only to cultured lands already under irrigation or expected to come under irrigation for important crops such as paddy, wheat, sugarcane, cotton, coffee, tea, tobacco, cocoanut, fruit trees, and rubber, a quantity of only 450,000 tons of nitrogen equivalent to 2·25 million tons of ammonium sulphate should be deemed sufficient for the present. Till recently the consumption of synthetic nitrogen mainly in the form of ammonium sulphate, in spite of the recent rapid increase in its application, has still been only about 30,000/35,000 tons of nitrogen, equivalent to 150,000/175,000 tons of ammonium sulphate. There is still a large gap to be bridged between the estimated minimum requirement and present consumption. Although it is desirable to step up consumption rapidly, there are a number of difficulties in the way of achieving it. Further propaganda and demonstration at suitable centres in different parts of the country through the medium of agricultural demonstration farms jointly organised by Government and the fertiliser industry might be necessary before the advantages of the application of synthetic fertilisers are sufficiently realised. The cost at which the fertilisers are made available to the agriculturists has also an important bearing on their extensive use, particularly for food

crops. In the circumstances, it may be necessary to place the target of annual consumption of synthetic nitrogen by the end of 1952-53 at 90,000 tons of nitrogen, equivalent to 450,000 tons of ammonium sulphate and by the end of 1955-56 at 120,000 tons of nitrogen, equivalent to 600,000 tons of ammonium sulphate.

(f) *Marketing.*—The import and distribution of nitrogenous fertilisers were in the hands of private organisations till Government took over the functions during war years and thereafter when supplies had to be secured from the World Nitrogen Pool under the Food and Agricultural Organisation on account of the limited supplies available. Both the bulk of domestic production and the imported product are still being distributed at a common price by the Government with the assistance and co-operation of different State Departments. As against a price of Rs. 350 per ton charged by Sindri Fertilisers and Chemicals Ltd., and the import price of Rs. 380 to 400 per ton, the pool price of ammonium sulphate is fixed at Rs. 380 per ton f.o.r. Sindri or ports.

With the commencement of production at Sindri, it might be necessary to work out suitable marketing arrangements for helping equitable distribution of the product from all the manufacturers so as to reach agriculturists in different areas at the lowest possible prices.

II. Problems of the Industry

The most important problem of the industry is the difficulty of obtaining adequate quantities of sulphur for producing sulphuric acid required in ammonium sulphate manufacture. FACT Ltd. have made arrangements for making use of gypsum from Trichinopoly, but it is reported that the quality of this deposit is somewhat unsatisfactory, and its economic mining difficult.

Judged by world standards, the sizes of the existing ammonium sulphate plants (with the exception of the Sindri factory) cannot be considered to be economic and this is one of the reasons for the high cost of production.

III. Programme of Development

(a) *Existing programme.*—Though Sindri Fertilisers and Chemicals have gone into production only in October 1951, certain developments are already visualised at the factory during the period of the Plan. At the present time the requirements of coke estimated at 500 to 600 tons per day for an annual production of 350,000 tons of ammonium sulphate are obtained from the Indian Iron and Steel Co. and from some other producers of coke. This arrangement will continue for three years at the end of which the fertiliser factory must draw the supplies from its own coke oven plant as the Indian Iron and Steel Co. will require its entire output of coke for its own use. A coke oven plant with a daily production capacity of 600 tons is therefore envisaged to be put up by Sindri Fertilisers and Chemicals at a cost of Rs. 235 lakhs. A sum of Rs. 903 lakhs has been provided against the Sindri Fertiliser Factory during the period of the Plan.

When the Sindri Fertiliser Factory goes into full production, calcium carbonate sludge equivalent to 1,000 tons per day would be produced as a by-product and its utilisation is envisaged through the establishment in the private sector of a cement plant at a cost of about Rs. 200 lakhs.

The estimated consumption of raw materials, fuel and power at Sindri for the production of 350,000 tons of ammonium sulphate may be taken to be:—

Coal	290,000 Tons
Coke	180,000 „
Gypsum	650,000 „
Soda ash	600 „
Iron oxide	360 „
Copper	144,000 Lbs.
Formic acid	32,400 „
Caustic soda	206,400 „
Sulphuric acid	1,140 Tons
Arsenic	9.0 „
Alum	86.4 „
Electricity	75.0 Millions KWhr.

(b) *Projects yet to be implemented.*—Mysore Chemicals and Fertilisers Ltd., have a project for the expansion of ammonium sulphate production from 6,600 tons to 13,200 tons per annum and FACT Ltd. have also under consideration a plan to increase the production of nitrogenous fertilisers at Alwaye by 46,000 tons per annum. Part of the output by the latter would be in the form of ammonium chloride, by making use of chlorine and hydrogen which would become available from the caustic soda plant of the Travancore-Mettur Chemicals Ltd. The projects are expected to cost about Rs. 1·25 crores and their implementation will depend on financial assistance being secured by these companies. In view of the importance of increasing the production of nitrogenous fertilisers, it is necessary to facilitate the carrying out of these projects.

Assuming that the projects described above will materialise, the rated capacity of the industry is envisaged to increase as given in the table below:—

Installed capacity of plants for nitrogenous fertilisers based on 330 working days (Fertilisers expressed as tons of ammonium sulphate)

	1950-51	1952-53	1955-56
By-product coke oven plants	26,070	27,070	27,060
Mysore Chemicals and Fertilisers, Belagula	6,600	6,600	13,200
Fertilisers and Chemicals (Travancore) Ltd., Alwaye	46,000	46,000	92,000
Sindri Fertilisers and Chemicals Ltd.	..	350,000	350,000
TOTAL	78,670	428,670	481,270

With the achievement of this development programme, there would be a gap of the order of 120,000 tons between the capacity and estimated requirements. With production estimated at about 450,000 tons, there would be a gap of about 150,000 tons in 1955-56 which would have to be made good by imports. The necessity for imports would be

reduced considerably if the scheme for the expansion of fertiliser production at Sindri on which a project report is being prepared under the T. C. A. programme for 1952, is taken up and implemented before the close of the Plan period. The expansion scheme for Sindri envisages the production of 100 tons of urea and 110 tons of ammonium nitrate per day making use of by-product coke oven gases and waste carbon dioxide from the operations. The cost of this project is estimated at Rs. 8·55 crores.

(c) *Recommendations*—(i) *Future lines of development.*—The manufacture of ammonium sulphate normally requires adequate resources for producing cheap sulphuric acid, so that countries endowed with natural occurrences of sulphur or pyrites are most favourably situated for undertaking cheap production of ammonium sulphate. Unfortunately, there are no occurrences of sulphur or even of large quantities of pyrites, so far as is known at present, in the Indian Union. Although it may be possible to develop the industry on the basis of importing such raw materials, it must be remembered that world resources of sulphur are not inexhaustible and difficulties may be experienced in securing adequate supplies of such strategic materials during abnormal times, thereby compelling plants to go out of production. However, the developments achieved in Germany during the first world war and subsequently adopted in France, the U. K. and elsewhere, show that countries possessing adequate deposits of gypsum are also in a relatively good position to manufacture ammonium sulphate using this alternative raw material. On the basis of utilising the gypsum resources at Khewra, Punjab (now in Pakistan), arrangements were made in 1945 for the manufacture of ammonium sulphate at Sindri using the gypsum process. With the resumption of normal trade with Pakistan, these resources should be still available for the Sindri factory. In addition, the Government have made arrangements for meeting the requirements of gypsum from other available sources in the country, particularly those in Bikaner and Jodhpur, so that the manufacturing programme undertaken at Sindri is not hampered.

Gypsum is an important raw material which is also required by the cement industry, and with the implementation of the development projects of that industry its requirements of gypsum will amount to about 162,000 tons. Gypsum is also one of the most important sources on which future developments in the sulphuric acid industry might have to be based. Before, therefore, we expand ammonium sulphate capacity still further, it is necessary to ensure that the present requirements of the fertiliser factory at Sindri are fully met and that the limited resources of gypsum are husbanded carefully till geological prospecting proves the occurrence of large deposits of gypsum or pyrites or alternative methods are developed for producing ammonium sulphate from other sulphur compounds available in the country. Since other nitrogenous fertilisers besides ammonium sulphate are proposed to be introduced in the country, early investigations should be undertaken by the Indian Council of Agricultural Research for collecting comparative data regarding the efficacy of different nitrogenous fertilisers—ammonium nitrate, nitro prills and nitro chalk, ammonium chloride, ammonium phosphate, urea and calcium cynamide—under different soil conditions and for different crops. Simultaneously, the National Laboratories and the Development Wing of the Ministry of Commerce and Industry should investigate the feasibility of manufacturing these alternative nitrogenous fertilisers at suitable places in the country and determine the economics of their production. With the additional hydro-electric power resources becoming available from the Hirakud, D. V. C. and Bakhra-Nangal projects, the question of locating some of these nitrogenous fertiliser industries in those places requires close examination.

(ii) The Ministry of Agriculture should take in hand the question of the full utilisation of the larger production of ammonium sulphate which would be available from the Government Fertiliser Factory by encouraging the use of such fertilisers in connection with the grow-more-food schemes and by propaganda and demonstration in private and Government agricultural farms.

(iii) It is essential to enable farmers to obtain cheap fertilisers and with this end in view, the industry should be given adequate facilities to maintain full production and bring down costs.

(iv) The National Chemical Laboratory should undertake immediate investigations into the development of processes for utilising, if possible, indigenous raw materials, such as magnesium sulphate and sodium sulphate, for the manufacture of ammonium sulphate.

(v) The Geological Survey of India should undertake detailed prospecting and estimation of available reserves of gypsum and pyrites in different parts of the country.

The following table summarises the programme of development of the nitrogenous fertiliser industry during the period of the Plan:—

	Unit	1950-51	1955-56
Number of factories	.	6	7
Annual rated capacity	Tons	78,670	481,270
Actual production	"	46,304	450,000
Estimated consumption	"	250,000	600,000

PHOSPHATIC FERTILISERS

I. Brief Survey of the Industry

Before the second world war superphosphate was manufactured on a small scale and its consumption was also not large. The demand increased significantly in the post-war period and gave a fillip to the indigenous industry. The indigenous production is still entirely in the form of single superphosphate manufactured from imported rock phosphate.

(a) *Location, rated capacity and production.*—In 1951 there were 14 plants in existence—seven of them with an annual rated capacity of 59,000 tons in Bombay State, one with a capacity of 10,000 tons in West Bengal, one with a capacity of 18,000 tons in Travancore-Cochin, two with a capacity of 7,500 tons in Mysore State, one with a capacity of 8,400 tons in Madras State, one with a capacity of 5,600 tons in Hyderabad State and one with a capacity of 15,000 tons in Delhi. The annual rated capacity which was about 47,000 tons in 1947 rose to nearly 125,000 tons before the end of 1950. It increased further to 173,855 tons by May 1952 as a result of the completion of expansions already undertaken.

The sizes of these units by world standards are small. This is consequently reflected in higher costs of production, more particularly so because the sulphuric acid units which supply acid for superphosphate manufacture are also small. The factories have been able to survive so far mainly because of the indirect protection they have received in the form of import control and pooled distribution of domestic production. There is, however,

now a healthy tendency to increase gradually the capacities of the individual units so as to make them more economic, and by the end of 1951-52 there were four units with capacities of over 15,000 tons of superphosphate per annum operating in the country.

The production of superphosphate has steadily risen during the last three years. While the production was only 21,358 tons in 1948, it increased to 46,358 tons in 1949, 52,432 tons in 1950 and 61,018 tons in 1951. Production in January-May 1952 came to 20,619 tons.

(b) *Capital and labour.*—It is difficult to estimate with any accuracy the amount invested in this section of the industry since, except in rare instances, superphosphate plants are attached to sulphuric acid plants and form part of groups of other chemical processing units. Separate allocation of capital cost of each of these plants are not available. For the same reason it is not possible to indicate the labour employed.

Superphosphate plants, however, do not require heavy capital. Small units working by the batch process and capable of manufacturing 20 to 25 tons of single superphosphate per day require a block capital of about Rs. 2½ lakhs inclusive of the value of plant and buildings, but excluding investment on the sulphuric acid plant. A fully mechanised unit capable of producing about 30,000 tons of superphosphate per annum which should eventually be regarded as an economic unit, starting from rock phosphate and sulphuric acid, requires an investment of about Rs. 10 lakhs, and inclusive of working capital not more than Rs. 25 lakhs may be necessary. But in the present stage of the sulphuric acid industry in the country it is necessary, in addition to providing plant items for the manufacture of superphosphate, to integrate it with the required sulphuric acid capacity. On this basis, a plant for producing about 35 to 40 tons of sulphuric acid per day and converting it into superphosphate in a fully mechanised unit is estimated to require a total investment of about Rs. 50 lakhs inclusive of working capital. The sulphuric acid plant assumed for the estimate is one designed to operate with sulphur and the question whether new plants depending on sulphur should be put up in future in the country has been discussed separately in the development plan for the Heavy Chemical Industry.

(c) *Raw materials.*—At the present time rock phosphate and sulphuric acid are the principal raw materials for superphosphate manufacture. Except for two, all the manufacturers produce their own sulphuric acid using imported sulphur. Till a few years ago, when imported rock phosphate was widely introduced as a raw material for superphosphate, particularly on account of Government encouragement of the export of bones, some superphosphate was manufactured by using indigenous bones as raw materials. In other countries where bones are utilised, valuable by-products, such as, bone glue and ossein are recovered before converting the residues into superphosphate and thereby importers in these countries are in a position to pay higher prices for this raw material. As the demand for bones at a high price increased, it was considered desirable in the country's interest to permit exports of bone grist and to import rock phosphate so that today all the superphosphate factories are using only rock phosphate as the raw material. It is only with the development of subsidiary industries for recovering bone glue and ossein that this indigenous raw material could again be used for the manufacture of phosphatic fertilisers. It is also necessary to organise proper collection of bones for enabling the entire quantity available to be profitably utilised.

(d) *Imports.*—Although comparatively large quantities of superphosphate were being imported pre-war, imports have recently been insignificant. Superphosphate of special quality to the extent of about 1,000 tons and 248 tons respectively was imported during

1948-49 and 1949-50. There were no imports in 1950-51 as against 2,615 tons imported in 1951-52.

(e) *Estimated consumption and requirements.*—The requirements of phosphatic fertilisers expressed in terms of P_2O_5, and reckoned on the basis of the application of nitrogen and P_2O_5 in proportions suitable to each crop all over the country should be placed at over a million tons. Even allowing for the reluctance of agriculturists to take to chemical fertilisers generally and phosphatic fertilisers in particular and for the fact that the actual consumption of nitrogen for meeting the requirements of the principal food crops grown in irrigated areas is only 450,000 tons, the demand for phosphatic fertilisers expressed in terms of P_2O_5 should be at least 250,000 tons. Reckoned for convenience in terms of 16 per cent. superphosphate,—the only phosphatic fertiliser which has so far received some attention,—the quantity required would be over 1·5 million tons. This estimated minimum requirement is very large when compared to the present limited consumption of only 50,000 to 60,000 tons of superphosphate annually during the last few years. Bones and bone products are also, however, used to some extent for meeting the requirements of phosphatic fertilisers. In spite of this, the quantity of phosphorus applied to the soils in India should be deemed very meagre and inadequate and therefore demands immediate attention in order to maintain soil fertility even at its present level.

Although the scope for phosphatic fertilisers in India is still almost unlimited, considerable inducement and financial subsidies were found necessary to bring the consumption of superphosphate even to the present level. Extensive propaganda on the necessity for using phosphatic fertilisers and the national advantages accruing from their use, in addition to making the product available at low prices by enabling the industry to bring down its costs of production, are essential before agriculturists will take to superphosphate on a larger scale. Taking into consideration these circumstances and the difficult sulphur supply position since the outbreak of the Korean War it is envisaged that a quantity of about 100,000 tons may be consumed by 1952-53 and about 200,000 tons by 1955-56. It is realised that this quantity is only a fraction of the minimum requirement and the target should be viewed more as an indication of the minimum possible consumption than as the real requirement of the country. Efforts should be made to produce and consume, if possible, even more than the specified 2 lakhs tons so as to enable the consumption of phosphatic fertilisers in the country to reach the target of minimum requirement of 250,000 tons of P_2O_5 as soon as possible.

(f) *Marketing.*—Superphosphate produced in the country is at present distributed to different consuming centres from a pool organised by the Central Government and at prices recommended by the Tariff Board. The Government had in the beginning the intention of importing part of the requirements and pooling the imported material with domestic production but when the industry responded by putting up additional manufacturing capacity, the necessity for imports was fully obviated. According to the present pooling arrangements, factories at or near the ports get a different price for their product from those in the interior whose ex-factory prices include a freight differential to cover the transport charges on imported rock phosphate and sulphur. In future, however, as demand increases and production in the bigger units gets harnessed, it might be necessary from the standpoint of securing increased consumption to arrange for competition between the manufacturers so as to bring down the price of this fertiliser. The pool has been abolished with effect from 15th August 1952.

II. Problems of the Industry

The problems of the superphosphate industry are the shortage of sulphur and the high cost of production. The necessity for switching over to alternate methods of producing phosphatic fertilisers obviating or reducing the necessity for sulphuric acid should, therefore, receive adequate attention. The uneconomic sizes of the units have contributed to increased costs of production and some of the existing units have plans to bring down costs by increasing the sizes of their plants.

III. Programme of Development

(a) *Existing programme.*—The figures of rated capacity are based on data supplied by the manufacturers. The projects of expansion under implementation and new schemes envisaged are as under:—

	1950-51	1952-53	1955-56	Year of completion of scheme.
Dharamji Morarji Chemical Co.	15,000	18,975	18,975	1951-52
Fertilisers and Chemicals (Travancore) Ltd.	18,000	45,375	45,375	1951-52
Parry and Co. (Ranipet Factory)	8,400	18,975	18,975	1951-52
Alembic Chemical Works Ltd.	..	2,500	2,500	1952-53
Bihar Government Superphosphate Factory	..	..	16,500	1953-54
Raja of Venkatagiri Plant	..	..	16,500	1953-54
Rest of manufacturers	82,060	90,530	90,530	..
TOTAL	123,460	176,355	209,355	..

As a result of the implementation of the projects mentioned above, the annual installed capacity would go up to 176,355 tons by 1952-53 and to 209,355 tons by 1955-56 on the basis of 330 working days. It may be pointed out that actual production of superphosphate is generally likely to be less than the rated capacity of the industry. While this is true in most industries, in the case of superphosphate there is a special reason which makes it even more probable. As will be seen from the plan for the sulphuric acid industry, production of sulphuric acid has gradually increased and additional capacity for this acid has come into existence during the last few years mainly for meeting the requirements of superphosphate production. Still, in the case of many manufacturers, the installed capacity for superphosphate is limited by their total sulphuric acid capacity. Further, if all the manufacturers utilise their superphosphate capacity fully, it would not be possible for them to meet the other existing demands for sulphuric acid and shortage of this acid might be experienced by other industries requiring it. On the basis of only a part of the sulphuric acid output, particularly in the smaller sulphuric acid factories, being deemed available for superphosphate manufacture, the capacity that could be availed of may be expected to be about 100,000 tons during 1952-53, and 186,000 tons by 1955-56. Since some, though not a considerable expansion of the sulphuric acid industry has also been contemplated, it is possible that superphosphate production will not be so adversely affected. However, the present difficulty in getting adequate supplies of imported sulphur for feeding sulphuric acid plants is bound to limit the actual production of acid in the

country, thus limiting the expansion of the sulphuric acid industry and consequently that of the superphosphate industry.

(b) *Recommendations*—(i) *Manufacture of alternative phosphatic fertilisers.*—Although superphosphate is the principal phosphatic fertiliser used in other countries also, greater attention has been given in recent times to the use of double and triple superphosphates, dicalcium phosphate, calcium metaphosphate and ammonium phosphate, all of which are more concentrated fertilisers and can bear higher transport charges. It is also possible to manufacture most of them by methods which do not involve the use of sulphuric acid. The development of these fertilisers assumes great importance in view of the fact that the resources of sulphur are very limited in the country. In view of the slow rate at which the consumption of phosphatic fertilisers can be stepped up in our country, it is considered that much progress may not be possible in the development of these alternative fertilisers during the period of the present Plan. All the same, investigations should be undertaken by the Indian Council of Agricultural Research to determine the comparative value of the several phosphatic fertilisers for different crops and under different soil conditions. Simultaneously, investigations should be undertaken by the Development Wing of the Ministry of Commerce and Industry and the National Chemical Laboratory in order to have ready proposals for the manufacture of such fertilisers near Hirakud, D. V. C. and new power installations near port towns, where cheap power may be eventually available. On the basis of such data and the increasing demand for phosphatic fertilisers, the question of putting up new manufacturing units during the second planned period should be closely examined.

(ii) *Manufacture of Kotka Phosphate.*—One of the possible methods of minimising the consumption of sulphuric acid (almost halving it) without affecting phosphatic fertiliser production is to manufacture "Kotka" phosphate in place of superphosphate. The implementation of this suggestion should not present much difficulty since raw materials and plant equipment required are not different from those already provided for superphosphate manufacture. The quality of the fertiliser would, however, have to be assessed in terms of citrate soluble P_2O_5 instead of water soluble P_2O_5 as in the case of superphosphate.

(iii) *Survey and utilisation of domestic rock phosphate.*—Rock phosphate required by the industry is imported from Egypt, Morocco, Kossier, and Safaga, since domestic resources available in the form of nodules at Trichinopoly and apatite near Singhbhum are not of suitable quality. Investigations should be undertaken by the Geological Survey of India to explore the other possible sources of phosphatic raw materials in the country. Investigations should also be undertaken both by the Bureau of Mines and the National Chemical Laboratory for beneficiation of the available resources at Singhbhum and development of methods for economic utilisation of the nodules and apatite for the manufacture of suitable phosphatic fertilisers.

(iv) *Better organisation of collection and processing of bones.*—Bones are on alternative raw material and at present only 150,000 tons are being collected and utilised directly as a fertiliser in the form of bone-meal or exported as bone grist out of a total estimated availability of 500,000 to 700,000 tons of raw bones. The large gap between availability and utilisation is due to a large extent to the centralisation of bone crushing mills in a few cities such as Bombay, Calcutta and Madras and the utilisation of the bones available only in the areas close to the railways, the product available in the interior remaining unutilised. If, on the other hand, the collection is properly organised, even if

a portion may ultimately remain over from areas widely scattered, it should be possible to make available 300,000 to 400,000 tons as against the present quantity of less than half that amount, the additional quantity becoming useful for direct application, for conversion into suitable phosphatic fertilisers and valuable by-products or for export for earning valuable foreign exchange as may be ultimately deemed most profitable in the national interest.

(v) *Development in the public sector.*—The superphosphate industry has so far been operated only in the private sector and the manufacturers of sulphuric acid have taken to superphosphate production mainly to find an important outlet for their acid. The first plant to be operated in the public sector will be the one which is being put up by the Bihar Government. In the future, as necessity for putting up units for the manufacture of alternative phosphatic fertilisers arises, the Government may have to take greater initiative in such developments.

(vi) *Standardisation of alternate phosphatic fertilisers.*—So far the superphosphate is evaluated in terms of water soluble P_2O_5 for assessing its quality. With the alternative phosphatic fertilisers like dicalcium phosphate and Kotka phosphate, quality has to be assessed on the basis of citrate soluble P_2O_5. The Indian Standards Institution should, in consultation with all interests, fix suitable standards for phosphatic fertilisers on citrate soluble basis.

The following table summarises the programme of development of the phosphatic fertiliser industry during the period of the Plan :—

	Unit	1950-51	1955-56
Number of factories	.	14	17
Annual rated capacity	Tons	123,460	209,355
Actual production	,,	55,089	180,000
Consumption	,,	58,400	200,000

POTASH FERTILISERS

1. Present Position, Process and Technique: Raw Materials

Potassic fertilisers in India are commonly derived—

(i) from the natural deposits of potassium nitrate occurring in Bihar, U. P., Punjab, Patiala, Bikaner and Bharatpur, which are extracted and purified by crude methods on a cottage or small-scale basis. Production before partition was about 15,000 tons per annum, but now the bulk of such units are in Pakistan and production in Bihar, U. P. and other parts is not sufficient to meet the demand. Potassium nitrate, in addition to its use as a fertiliser, is also required for the manufacture of gun powder and pyrotechnic compositions and other chemicals, particularly during times when imported sodium nitrate is not available. The State Governments of Bihar, U. P., PEPSU and Rajasthan should take necessary steps to organise cottage scale manufacture of potassium nitrate on a co-operative basis so as to increase the output of the product and also to bring down its cost;

(ii) as a by-product of salt manufacture: Potassium salts in the form of potassium chloride can be recovered as a by-product of salt works. Although according to the Salt Experts Committee it is possible to produce a quantity of nearly 85,000 tons of K_2O from all the salt works in the country, actual production is limited to the quantity recovered in the Tata Chemical Works at Mithapur. The production during 1945-46 was 83 tons; 1946-47, 44 tons; and 1947-48, 28 tons. Potassium chloride in addition to being useful as a fertiliser, is also required as a raw material for the manufacture of caustic potash and potassium chlorate. The by-product potassium chloride is not sufficiently pure for such purposes, but it is not unsuitable for use in fertiliser mixtures except in cases where it is considered undesirable to increase the chloride content of the mixture. Potassium sulphate is a better fertiliser than potassium chloride, particularly because traces of magnesium chloride associated with the by-product potassium chloride are injurious to vegetable life, but the shortage and high price of sulphuric acid in the country do not permit cheap conversion of potassium chloride to potassium sulphate and this has been responsible for the non-development of this industry;

(iii) from molasses—molasses is obtained as a by-product of the sugar industry. Although so far potash salts have not been recovered on any large scale from molasses in India, advantage had been taken of the existence of potassium salts in molasses by using distillery slops containing such salts for fertilising suitable crops in the neighbourhood of distilleries. The quantity of such potassium salts made available cannot be estimated.

II. Estimated Requirements

Although the requirements of potash fertilisers are large in other countries, according to expert opinion the demand for them in this country is not large. The estimated annual requirements of potash fertilisers on the basis of using them only for the most essential crops are roughly 37,500 tons of all potash fertilisers reckoned together and expressed as K_2O.

III. Marketing

Potash salts are generally marketed by fertiliser distributing firms in the form of ready mixtures containing definite proportions of K, P and N. Rarely does a farmer purchase pure potash salts and prepare the mixture himself. While impure potassium salts either as potassium chloride or in the form of double salts containing it are made available to fertiliser mixing firms from indigenous sources, purer varieties of potash salts both chloride and sulphate are imported from abroad both for use as fertilisers as well as for meeting the requirements of such salts for other purposes.

IV. Future Developments and Recommendations

(i) As the demand for potash salts might increase gradually to more than about 37,500 tons expressed as K_2O and it might be possible to recover nearly 52,700 tons expressed as K_2O from all the salt works in the country, efforts should be made to encourage the bigger salt manufacturers to put up by-product recovery plants and make the required quantities of potassium chloride available for fertiliser and other purposes. Encouragement

should also be given to such firms to split the double salts containing potassium chloride and purify the crude product for producing higher grade material so as gradually to displace the product now being imported from abroad.

(ii) The State Governments of Bihar, U. P., PEPSU and Rajasthan should take necessary steps to organise cottage scale manufacture of potassium nitrate on a co-operative basis so as to increase the output of the product and also to bring down its cost.

(iii) To enable potassium salts to be recovered and made available for use in distant places, it is necessary to recover such potassium salts from molasses as well as distillery slops by adopting suitable processes which may be standardised by the manufacturers of sugar and alcohol in consultation with the National Chemical Laboratory.

(iv) In the event of potassium salt supplies from the above sources being found inadequate, in the long run the possibilities of recovering potash salts from the flue gases of cement furnaces might also require consideration.

23. HEAVY CHEMICALS

The heavy chemical industry is concerned with the manufacture of chemicals generally produced in large quantities and required by other manufacturing industries. Though this group covers a wide range of products, in view of the limited development of the country's industrial economy, the plan for the heavy chemical industry embraces only the most important products,—*viz.* (A) sulphuric acid, (B) soda ash, (C) caustic soda and (D) certain miscellaneous chemicals.

A. Sulphuric Acid

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—The manufacture of sulphuric acid and other chemicals generally derived from it—such as hydrochloric acid, nitric acid and sulphates—was the first branch of the heavy chemical industry to be established in the country owing to the advantage of natural protection against foreign competition enjoyed by sulphuric acid, a highly corrosive material the transport of which by sea was not easy and involved high cost. The beginnings of sulphuric acid manufacture date from about the end of the 19th Century, the pioneers of this industry being Messrs. D. Waldie & Company and the Bengal Chemical and Pharmaceutical Works in Bengal, Messrs. Parry & Co. in Madras and the Eastern Chemical Company Ltd. in Bombay. The industry received a great fillip during the Great War (1914-18) and new plants came into existence in different parts of the country in the post-war period. The first plant for the manufacture of sulphuric acid by the contact process was established at Jamshedpur by the Tata Iron & Steel Company for meeting the requirements of their iron and steel plant for recovering by-product ammonium sulphate and the pickling of steel. The industry passed through an era of difficulties in the inter-war period particularly due to foreign competition in respect of salts manufactured from mineral acids. As a result, the output of sulphuric acid rarely reached even 50 per cent. of the installed capacity before the second world war.

During the war the production of sulphuric acid in the country, under the stimulus of the need to meet the requirements of the Defence and other industries, increased and thus diminished the gap between actual production and installed capacity. The industry expanded considerably as a result of the installation of new plants in the post-war period and, by the end of 1950, there were 43 units (30 chamber plants and 13 contact plants) engaged in the manufacture of sulphuric acid with an annual production capacity of 150,000 tons in terms of 100 per cent. acid. By June 1952 some of the chamber plants in existence were scrapped and 8 new contact plants under construction had gone into production. The capacity of the sulphuric acid industry and its regional distribution in June 1952 was as under :—

Regional distribution of sulphuric acid units in June 1952

State	Number of units		Annual rated capacity in terms of 100 per cent. acid (330 working days)		
	Total Number	Number of contact plants	*Chamber* process (tons)	*Contact* process (tons)	Total (tons)
Assam	1	1	..	6,600	6,600
West Bengal and Bihar	13	7	12,660	43,900	56,560

Regional distribution of sulphuric acid units in June 1952—contd.

State	Number of units		Annual rated capacity in terms of 100 per cent. acid (330 working days)		
	Total Number	Number of contact plants	Chamber process (tons)	Contact process (tons)	Total (tons)
Bombay	12	7	11,913	23,100	35,013
East Punjab and Delhi	9	2	8,355	6,600	14,955
Uttar Pradesh	4	..	5,775	..	5,775
Madhya Pradesh	1	..	825	..	825
Madras	2	1	5,280	8,250	13,530
Former Indian States and States Unions	5	3	3,713	52,470	56,183
TOTAL	47	21	48,521	140,920	189,441

In contrast to the conditions obtaining in other industrially advanced countries, the plants in India are small in size, the only exceptions being the plants of Fertilisers & Chemicals, Travancore Ltd., Travancore (75 tons per day), the Tata Iron & Steel Company (50 tons per day) and the Indian Iron & Steel Company (60 tons per day). As regards the 26 chamber plants in existence, most of them are small and together account for a capacity of only 48,500 tons of acid per year. One of these units is so small that it has an installed capacity of 180 tons only per annum. Most of these chamber plants are old and might require thorough renovation in order to keep them in operation for further long periods. But, in view of the small size of these units and the need for developing the industry on entirely new lines in the future, such extensive rebuilding of these old units may not be justified.

The production of acid in 1950 was 101,000 tons as 100 per cent. acid, in comparison with 60,000 tons per annum in 1946 and 1947 thus indicating the rapid increase in the post-war period. Production in 1951 came to 106,935 tons and to 44,880 tons in January-June 1952.

(b) *Capital and labour.*—The sulphuric acid industry has been built up in the private sector. The capital invested on all the sulphuric acid units has been estimated at Rs. 200 lakhs. It is not possible to give separately the labour employed because these firms also produce a number of other products and separate figures are not available.

(c) *Raw materials.*—Though sulphuric acid is produced in foreign countries, from different raw materials like sulphur, gypsum, iron pyrites and sulphide ores of other metals, it has so far been produced in this country from imported sulphur only. The consumption of sulphur for the production of sulphuric acid was estimated at about 35,000 tons in 1950 and 37,000 tons in 1951. Plants operating the chamber process require in addition sodium nitrate, though only in small quantities. The total requirements of sodium nitrate were estimated at about 1,000 tons in 1950-51.

(d) *Imports and exports.*—As explained at the beginning, it is difficult to import sulphuric acid in view of its highly corrosive nature. Therefore, imports of this acid are very small and are mainly restricted to special qualities, uch as oleum or those required for analytical and pharmaceutical purposes. For the same reasons sulphuric acid is also not exported in any considerable quantity.

(e) *Estimated consumption and requirements.*—The consumption of sulphuric acid is an indicator of the industrial activity of a country. In the pre-war period the demand for sulphuric acid both direct and indirect was of the order of 50,000 tons. The demand has shown considerable expansion during and after World War II and this is reflected in the expansion of production which since 1947 has been closely linked with the development of the fertiliser industry. The direct demand for sulphuric acid is limited and a large proportion of the acid is consumed within the premises of the factory for the manufacture of various salts. The annual consumption of sulphuric acid by various industries and in the manufacture of salts estimated on the basis of the acid actually consumed in the first half of 1951 is given below :—

Approximate consumption of sulphuric acid in different industries in 1951

	Quantity of acid consumed expressed as 100 per cent. acid
Alums	935 tons
Aluminium sulphate	9,078 ,,
Epsom salt	1,705 ,,
Copperas	245 ,,
Copper sulphate	212 ,,
Bichromates	1,963 ,,
Ammonium sulphate	29,303 ,,
Superphosphate	24,407 ,,
Acid hydrochloric	2,155 ,,
Acid nitric	1,980 ,,
Iron and Steel Industry	18,000 ,,
Mineral Oil Industry	2,800 ,,
Miscellaneous, including Rayon, Titanium oxide, Leather Accumulators, Distilleries and Textiles.	14,152 ,,
TOTAL	106,935 ,,

Taking into account the possible demand from different consuming industries during the coming years, the demand for sulphuric acid is estimated at about 200,000 tons by 1955-56 of which 116,000 tons would be for the manufacture of fertilisers. The figure of 116,000 tons might be exceeded if the production of superphosphate exceeds the minimum of 180,000 tons envisaged by 1955-56. In view of the shortage of sulphur experienced in recent years, which might become a long-term difficulty, and the fact that the manufacture of sulphuric acid in this country has so far been based only on this imported raw material, it is obvious that the availability of sulphur will set the limit to the production of sulphuric acid during the period of the Plan and until such time as sufficient alternative raw materials whether indigenous or imported are developed for exploitation in place of sulphur. The demand for sulphuric acid has therefore to be maintained as far as possible at the level envisaged above by economising its consumption in different directions including the manufacture of fertilisers through the adoption of

processes requiring either smaller quantities of sulphuric acid or based on altogether different chemical raw materials. Additional demand for sulphuric acid could be permitted only if some of the alternative domestic resources under consideration bear fruit and the manufacturing units reorganise their production of the acid.

II. Problems of the Industry

The main problems of the sulphuric acid industry relate to :—

(1) raw material supplies;

(2) size of the units.

Raw materials.—As mentioned before, the industry has been developed so far only on the basis of using imported sulphur. It is essential to re-orient the industry for utilising other domestic raw materials. Some of those already available or which might become available in the country are :—pyrites, gypsum, waste sulphurous gases of metallurgical operations, sodium sulphate, magnesium sulphate and sulphur present in coals, or refinery waste gases. Pyrites are available, as far as is known at present, at Tara Devi (Simla Hills), Am-Jor in Bihar and Chitaldrug in Mysore State. The quality of the pyrites from the first two sources, though differing slightly, is suitable; but that from the last source still requires examination. The main difficulty in supplying pyrites from Tara Devi is one of economical mining and transport which makes the raw material costly for use in the sulphuric acid plants in different parts of the country. Although the existence of a small amount of only 40,000/50,000 tons of pyrites has been proved so far at Am-Jor, it is expected that further geological prospecting will reveal larger resources in that area. Arrangements are in hand, however, for enabling some of the existing sulphuric acid manufacturers (about three or four)—particularly the chamber plant operators—to utilise pyrites from this source for producing sulphuric acid in the course of the next 12 to 18 months.

So far as gypsum is concerned, although there are small deposits in a number of places, the extensive ones occur in Rajasthan and near Trichinopoly. The source at present largely exploited is the Rajasthan deposit which is estimated to yield about 20·0 million tons, of which 25 per cent. only is expected to be of over 87 per cent. quality, the minimum grade accepted for use at Sindri. But this source might have to be reserved primarily to meet the requirements of the Sindri Fertiliser Factory till other more favourable sources are found. The gypsum resources available at Trichinopoly are attempted to be tapped by FACT Ltd. with a view to its being used in the production of ammonium sulphate.

The waste gases from the Ghatsila Works of the Indian Copper Corporation Ltd. contain sulphurous gases which could be harnessed for producing sulphur or sulphuric acid. Such utilisation is estimated to be able to provide 6,000/7,000 tons of sulphur or an equivalent quantity of sulphuric acid.

Whereas the change-over from sulphur to pyrites and gypsum would not present any difficulty if the domestic availability of these materials is ensured, investigations on the development of processes for utilising sodium sulphate to produce sulphuric acid by the electrolytic and chemical processes and magnesium sulphate from sea-water bitterns for the simultaneous manufacture of sulphuric acid and magnesia are necessary and should be undertaken at the National Laboratories. Similarly extraction of sulphur from high sulphur bearing coals and recovery of sulphur by bacteriological process should be taken up for research investigation and development.

Size of the units.—The existing sulphuric acid units are generally of small size and this has led to comparatively high costs of production with the result that the development of industries utilising sulphuric acid has been impeded. Duplication of small units to secure larger total capacity does not provide a solution of the problem of uneconomic size. It is realised that the development of small units was inevitable in the context of industrial development some years back since difficulties of transporting acid over long distances and the non-development of acid-consuming industries in centres of acid production did not justify the installation of large units. A change in outlook is, however, necessary, and future plans should be directed towards putting up units of 50 tons and above of acid per day by co-ordinating acid-consuming industries along with acid production. This should also enable locally available raw materials to be utilised more satisfactorily.

III. Programme of Development

(a) *Existing programme.*—The following expansion plans and new projects have been envisaged for completion during the period of the Plan :—

Company	Daily rated capacity (Tons of 100 per cent. acid)	Annual production (330 working days) (Tons of 100 per cent. acid)	Period when expected to come into regular operation
1. *Parry and Co	25	8,250	1951-52
2. *Western India Chemicals, Poona	10	3,300	1951-52
3. *FACT Ltd	75	24,750	1951-52
4. *Indian Steel and Wire Products Ltd., Jamshedpur	10	3,300	1951-52
5. *Alembic Chemical Works, Baroda	10	3,300	1951-52
6. *Rohtas Industries, Dalmianagar	10	3,300	1951-52
7. *National Rayon Ltd., Kalyan	10	3,300	1951-52
8. *D. C. M. Chemical Works, Delhi	10	3,300	1951-52
9. Phosphate Co. Ltd., Calcutta	25	8,250	Middle of 1953
10. Bihar Government Superphosphate Factory, Sindri	25	8,250	,,
11. Gwalior Rayon Manufacturing Co., Nagda	25	8,250	,,
12. Raja of Venkatagiri Plant	20	6,600	,,
		84,150	

As a result of the implementation of the above projects, the capacity for sulphuric acid manufacture would go up to 220,791 tons by the end of 1955-56. The plant projected by the Raja of Venkatagiri for the manufacture of superphosphate provides for the exploitation of gypsum for the manufacture of sulphuric acid. In addition, FACT Ltd. have envisaged alterations to one of their sulphuric acid plants at an estimated expenditure of Rs. 20/25 lakhs with the object of operating it on pyrites instead of sulphur. A loan has been granted by the Industrial Finance Corporation for this purpose. This latter development is expected to relieve dependence on sulphur to the extent of about 8,000 tons and also help to lay the foundations for the use of pyrites on a large scale in one of the biggest units in the country. In connection with possible future developments, reference should also be made to sulphuric acid plants that might have to be established as part of the Government Iron & Steel project and the projects for petroleum refineries. As the details of these are still being worked out these have not been included in the appended schedule.

*These units have gone into production.

(b) *Recommendations.*—(i) Most of the projected new plants are associated with the development of the fertiliser industry, a few notable exceptions being those of the National Rayons and the Gwalior Rayon Manufacturing Company. As a result of their implementation the requirements of sulphur for full production would increase to about 60,000 tons a year and it is not desirable to build up further capacity for sulphuric acid manufacture based on an imported raw material like sulphur the supply of which has become inelastic. For securing independence from foreign sulphur it is necessary to develop the indigenous manufacture of sulphur at least for meeting essential requirements, from raw materials like gypsum, sodium sulphate, etc. A project for the production of 100 tons of sulphur per day from gypsum for meeting the most essential requirements of sulphur has been under scrutiny and its implementation should help to solve a difficult problem relating to the supply of this basic material. This plant would also produce about 350 tons of cement per day and requires a total investment of about Rs. 3·5 crores. The daily demand for gypsum would be of the order of 600 tons. The Government should assist as much as possible the implementation of this project in the private sector.

(ii) Apart from the production of sulphur from gypsum, the possibility of recovering it from the smelter gases of the Indian Copper Corporation Ltd. and from the zinc concentrates of Mewar should also be explored and facilities given for putting up plants for recovering this waste sulphur either in the elemental form or as sulphuric acid.

(iii) In view of the difficulties connected with the supply of sulphur for stepping up the production of sulphuric acid, economies in the consumption of sulphuric acid and avoidance of its use in manufacturing some of the commodities appear to be obvious ways of meeting the difficult situation. Some of the lines of effecting such economy are :—

(1) Replacement of sulphuric acid by hydrochloric acid produced from hydrogen and chlorine generated in caustic soda-chlorine plants.

(2) Reduction in consumption by manufacture of Kotka Phosphate.

(3) Manufacture of dicalcium phosphate instead of superphosphate, thus changing over from sulphuric acid to hydrochloric acid as raw material.

(4) Manufacture of Epsom Salt from by-product bitterns.

(5) Replacement of alumina ferric and alum by ferric chloride or aluminium chloride in water purification.

For giving effect to the economies suggested above, a Committee of technical experts drawn from different consuming industries should be constituted to work out the economies possible in the consumption of sulphuric acid and special producers and consumers of all alternative products should be given necessary encouragement.

(iv) Although in the light of the present world sulphur situation and the prospects for the future, there would be no room for putting up additional sulphuric acid capacity based on sulphur, and all our efforts should be directed to getting even the existing manufacturers to change over to other raw materials like pyrites, gypsum, etc., as much as possible, it may be difficult to rule out altogether the necessity for new units operating on sulphur. These would have to come into existence in connection with additional coke oven and steel capacity, crude oil refining, etc. The type and size of such plants to be permitted would have to take into consideration the difficult raw materials supply position that may have to be faced from time to time in the future. For economic operation future pyrites and gypsum sulphuric acid plants should have large capacities of the order of 50 to 100 tons of acid

per day and units of such sizes should be planned at the proper time for meeting long-range demands.

The table below summarises the programme of development of the sulphuric acid industry during the period of the Plan:—

	1950-51	1955-56
Number of units	43	51*
Annual rated capacity (tons of 100 per cent. acid)	150,410	220,791
Actual production (tons of 100 per cent. acid)	99,153	200,000

*This takes into account four chamber plants scrapped in 1951-52 ; but does not include new plants which are likely to be set up in connection with coke oven plants and oil refineries.

ALKALI INDUSTRY

In contrast to the sulphuric acid industry, the alkali industry, comprising the manufacture of soda ash and caustic soda, presents more serious and complex problems in regard to location, choice of process, fuel and raw material supplies, etc., and the capital investment required is also high. Further, being solid products, both caustic soda and soda ash are more vulnerable to foreign competition than sulphuric acid. For these reasons, the development of the alkali industry has not attracted the necessary attention so far and it is only since the middle of the thirties that active steps were taken to establish the manufacture of caustic soda and soda ash. The Dhrangadhra Chemical Works, the Mettur Chemical and Industrial Corporation, Tata Chemicals and the Alkali and Chemical Corporation of India were the pioneers in the field of the alkali industry and the projects were formulated even before the second world war. The intervention of the war delayed the implementation of some of the projects to some extent so that it may be said that the alkali industry in India is also a war-time industry. It has seen several vicissitudes during the last ten years. At present, there are only two factories producing soda ash and six factories producing caustic soda, of which three units have come into existence in the post-war period. The development of the alkali industry is dealt with in the following sections under (B) Soda Ash and (C) Caustic Soda.

B. SODA ASH

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There are, at present, two soda ash plants—The Tata Chemical Works, Mithapur, and the Dhrangadhra Chemical Works, Dhrangadhra—both in the western part of India, producing soda ash of the light variety. They have a combined annual capacity of 54,000 tons. Though the plant of Tata Chemicals has a rated capacity of 120 tons per day, the actual capacity during the last three years has been only 80 tons per day mainly owing to lack of proper balance between the different constituent units. The plant of Dhrangadhra Chemical Company has a daily rated capacity of 60 tons; but it has been working for 300 days per annum only as it had to be kept idle for repairs every year to the lime kiln which was made to work beyond its rated capacity.

The soda ash industry in the country has been developed by private enterprise, with the assistance and support of the former States of Dhrangadhra and Baroda. The industry passed through a severe crisis during 1949 as a result of heavy imports of soda ash during the O. G. L. period and on the basis of the recommendations of the Tariff Board, the Government came to the assistance of the industry by adopting a system of protection-*cum*-subsidy.

As against the rated capacity of 54,000 tons per annum, the production of soda ash rose from 13,624 tons in 1947 to 43,790 tons in 1950 and 47,528 tons in 1951. Production in January-June 1952 was 16,896 tons. The low production in 1948 and 1949 (28,150 tons and 17,913 tons respectively) was due to the fact that the factories had to close down for several months as a result of over-accumulation of stocks of soda ash in the country. Production, however, has shown an upward trend after the resumption of manufacture with the grant of protection to the industry in 1950. The quality of soda ash produced in the country is found suitable for all uses where light soda ash is required. In respect of sodium chloride content, the indigenous product is not comparable with the imported one. A tentative standard specification has been laid down prescribing the quality for the Indian product and it is expected that with improvements in production effected by the companies, the quality will also improve in respect of the limit for sodium chloride so that the product will be comparable to the imported product in all respects.

(b) *Capital and labour.*—The capital invested on the soda ash plant of Tata Chemicals was Rs. 138 lakhs on 30th June 1950 and that of the Dhrangadhra Chemical Company was Rs. 28·7 lakhs on the 31st March 1950. The low capital investment on the Dhrangadhra plant was due to the fact that the plant was sold by the Dhrangadhra State to the company at a price of only Rs. 10·5 lakhs in 1950. As the factories are also engaged in the production of many other associated chemicals, it is not possible to give the exact number of workers engaged in soda ash manufacture.

(c) *Raw materials.*—Due to the fact that both the soda ash plants are of small to medium size and also because of the poor quality of the raw materials used, the requirements of raw materials per ton of soda ash have been high in comparison with the more advanced countries. The consumption of raw materials and fuel per ton of soda ash is as follows :—

Salt	2·0 tons
Limestone	1·75 "
Coke	0·18 "
Ammonium sulphate	0·02 "
Sodium sulphide	0·01 "

(d) *Imports and exports.*—Imports of soda ash into India in recent years have been erratic. They varied from 163,567 tons in 1948-49 to 12,295 tons in 1949-50, 29,817 tons in 1950-51, and 85,315 tons in 1951-52. It has been difficult to obtain soda ash from abroad since the outbreak of the Korean War and the price of imported soda ash has also risen considerably.

(e) *Estimated consumption and requirements.*—The largest industrial consumer of soda ash in the country is the glass industry which requires heavy soda ash. In 1938-39, the total consumption as indicated by imports was about 65,000 tons. Since then, there has been a remarkable increase in the demand for soda ash, which in 1950-51 was estimated as follows on the basis of the Tariff Board Report on the Soda Ash Industry (1951) :—

Glass	40,000 tons (heavy ash)
Textiles	7,000 tons
Silicate of soda	12,000 "
Paper	5,000 "
Bichromate and other chemical industries	6,000 tons (heavy ash)
Dhobies, laundries, etc.	45,000 "
TOTAL	115,000 "

The demand for soda ash is expected to increase to 155,000 tons by 1955-56 on the basis of the developments envisaged in the consuming industries. If provision is also made for the manufacture of about 30,000 tons of caustic soda by the chemical process, an additional 50,000 tons of soda ash would be required per annum.

II. Problems of the Industry

The most important problem of the soda ash industry relates to its location. The original expectations that the Tata Chemicals plant located in close proximity to salt and limestone resources would possess considerable advantages was falsified in actual operation, since the factory was obliged ultimately to draw its limestone supplies from the Ranavav quarries near Porbandar at a considerable distance from the factory. In addition to the high cost of limestone which such transport entails, there are frequent difficulties in securing adequate transport facilities. The possibility of ultimately transporting coal by the sea route from the coalfields in the Bengal area or from South Africa, as originally envisaged, is also not feasible on account of high ocean freight-rates. The change from broad gauge to metre gauge involved in the transport of coal by the all-rail route creates problems. Supplies of sweet water to meet the full requirements of the factory and the town have also not been forthcoming and cause considerable anxiety.

As regards the Dhrangadhra factory also, the disadvantages of long and costly transport of both limestone and coal exist and, in addition, the plant is of smaller capacity than the Mithapur unit.

The soda ash industry is one of the most secretive in the world and lack of previous experience of this industry has also been adding to the difficulties; but with the experience already accumulated by the two units, it may be possible to plan future developments on correct lines.

III. Programme of Development

(a) *Existing programme.*—Tata Chemicals Ltd. have under contemplation a project for expanding the output of soda ash to 150 tons per day. For achieving this expansion, an expenditure of Rs. 15 lakhs on the soda ash plant and about Rs. 25 lakhs on the brine evaporator, salt works and service plants has been envisaged. The above expansion in output of soda ash from the Mithapur plant is expected to be attained by the beginning of 1953.

The Dhrangadhra Chemical Company, who have been so far working their plant for 300 days only in a year, propose to carry out additions to their plant so as to enable it to be operated for 360 days. The additions relate mainly to the installation of one more lime kiln, and the cost of the kiln and other repairs and renewals is expected to be about Rs. 10 lakhs. Although it is claimed that the Dhrangadhra Chemical Company can further increase the capacity of their soda ash plant to 90 tons a day, plans for achieving this increase were held in abeyance for want of finance. The expenditure required for increasing the daily capacity to 90 tons is estimated to be of the order of Rs. 25 lakhs. In view of the importance of soda ash to several consuming industries and the fact that this expansion would make the soda ash factory a better unit from the standpoint of costs of production, the Dhrangadhra Chemical Company has been assisted to achieve the expansions by the grant of a loan to the required extent from the Industrial Finance Corporation.

(b) *Recommendations.*—Apart from the expansion plans of the existing manufacturers discussed above, there are no other definite schemes for putting up additional soda ash

capacity in the country in the immediate future. However, in view of the importance of the soda ash industry to the national economy both because it is an important raw material for a number of industries and also on account of the necessity of producing additional caustic soda in the country by causticising cheap soda ash, it is necessary to develop the soda ash industry in relation to the increasing demand for this material. Even after reckoning the expansion schemes of the existing manufacturers, there is room for two new soda ash plants each of about 100 tons daily capacity to help to bridge the gap between the demand for soda ash and the indigenous supplies. One of the units should arrange to manufacture dense soda ash required by the indigenous glass and bichromate industries, the demand for which was estimated in 1950-51 at 46,000 tons per annum.

A site in close proximity to sources of all the three important raw materials, *i.e.*, salt, limestone and coal, should be regarded as an ideal location for a soda ash plant, but it is well known that there are only few such sites available in the world and the one which could command certain locational advantages from this standpoint and which was utilised by Messrs. Imperial Chemical Industries for putting up one of the soda ash plants in India has now gone to Pakistan. In a vast country like India, it is also necessary to reckon the high cost of distribution of cheap products, such as soda ash, so that in spite of certain locational disadvantages from the ideal standpoint, the question of putting up soda ash plants in locations convenient from other angles also has to receive consideration. Sites, therefore, offering advantages at least in respect of two raw materials with the possibility of facilities for cheap and easy transport to bring the third from other centres of production and simultaneously to distribute the final product to the consuming centres, should receive careful examination. The necessity of providing adequate capacity for the manufacture in the country of basic products like soda ash so as to ensure supplies to the consuming industries on a steady and regular basis is of such primary importance that it is essential that the industry be developed even in the absence of ideal sites. A thorough examination of the prospects and a study of suitable sites for soda ash plants should be immediately undertaken by a committee of technical experts under the Development Wing of the Ministry of Commerce and Industry, entrusted with the work of surveying all the possible areas in the country and of preparing necessary project reports for new plants. Some of the possible areas which might require such careful examination are Porbandar and Jaffrabad in Saurashtra, Tuticorin and Tinnevelly in South India, areas in Orissa and Bengal where salt production might be developed, and the Lake Chilka area in Madhya Pradesh and Orissa.

The capital investment required for soda ash plants of 100 tons capacity per day is estimated roughly at Rs. 1·5 to Rs. 2 crores at present prices. As mentioned before, both the units operating in the country were started with the active support and assistance of the State Governments of Baroda and Dhrangadhra and for unavoidable reasons the industry has taken a long time to stabilise itself in the country. In the circumstances and also in view of the high capital requirements, it might be necessary for the development of new units to be actively encouraged and supported by the State.

The table below summarises the programme of development of the soda ash industry during the period of the Plan :—

	Unit	1950-51	1955-56
Number of units	..	2	2
Annual rated capacity	Tons	54,000	86,000
Actual production	,,	44,650	77,800

C. CAUSTIC SODA

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—According to the Report of the Tariff Board on the Caustic Soda Industry (1950) the total annual rated capacity at the beginning of 1951 of the six caustic soda plants working by the electrolytic process was 12,725 tons and of the plant of Tata Chemicals for operating the chemical process was 6,000 tons making a total capacity of 18,725 tons per annum. The annual capacity of the electrolytic caustic soda industry has increased to 16,576 tons by the middle of 1952 as a result of the completion of the expansion of the unit of the Mettur Chemical & Industrial Corporation and of the first stage expansion of the caustic soda plant belonging to the D. C. M. Chemical Works. These plants are also equipped to produce the following quantities of other heavy chemicals using chlorine simultaneously produced in the electrolytic plants :—

	Annual rated capacity (Tons)
Liquid chlorine	13,517
Bleaching powder (25% available chlorine)	7,800
Bleach liquor (expressed in terms of chlorine)	1,888
Hydrochloric acid (32 % acid)	8,065

In addition to the above manufacturers of caustic soda for sale, some of the paper manufacturers are also equipped with small caustic-chlorine plants for partially covering their requirements of both caustic soda and chlorine. The combined installed capacity of such plants is approximately 4,000 to 4,500 tons of caustic soda per annum, so that the total capacity for caustic soda production in the country was 22,725 tons per annum early in 1951. By June 1952 the capacity had increased to 26,576 tons, according to the latest assessment of the Development Wing of the Ministry of Commerce and Industry.

The industry is not concentrated in any particular locality, but is distributed over the different parts of the country. The six electrolytic caustic soda plants are located at Rishra (West Bengal), Mettur (Madras), Ahmedabad (Bombay), Mithapur (Saurashtra), Dehri-on-Sone (Bihar) and Delhi.

Actual indigenous production of caustic soda and the associated chemicals in the post-war period was as follows :—

Year	Caustic soda* (Tons)	Liquid chlorine* (Tons)	Bleaching powder (Tons)
1947	4,192	1,724	2,989
1948	5,862	1,749	3,443
1949	7,315	2,547	2,528
1950	10,846	3,970	3,309
1951	14,722	5,268	3,583
1952 (January-June)	7,956	2,880	441

(b) *Capital and labour.*—The capital invested in the caustic-chlorine plants as in 1951 has been estimated at Rs. 195 lakhs on the basis of an average investment of Rs. 30 lakhs for a plant of 5 tons daily capacity equipped also with auxiliary facilities for the liquefaction of chlorine. In view of the fact that the manufacturers of caustic soda produce various other products also, it is not possible to give separate figures of the labour employed in the caustic soda industry.

* Exclusive of the production by the paper mills.

(c) *Raw materials and power.*—The requirements of raw materials for a production corresponding to the installed capacity of 18,725 tons in 1951 by the electrolytic and chemical processes are roughly 23,000 tons of salt and 9,600 tons of soda ash. The electrolytic plants consume 2,500 to 3,000 KWHrs. of electricity per ton of caustic soda produced.

(d) *Imports and exports.*—Imports of caustic soda showed a remarkable increase in the inter-war years due to the expansion of the soap, paper, vanaspati and other basic industries. During the post-war years, the imports of caustic soda and co-products have been as follows:—

Imports of caustic soda, liquid chlorine and bleaching powder into India

Year	Caustic soda	Liquid chlorine	Bleaching powder
	(Tons)	(Tons)	(Tons)
1947-48	21,231	..	8,367
1948-49	90,616	..	11,520
1949-50	12,989	0·3	5,513
1950-51	22,000	21·5	5,633
1951-52	61,849	..	8,810

(e) *Estimated consumption and requirements.*—The demand for caustic soda as reflected by the imports in 1938-39 was about 25,000 tons and it rose considerably during the war years consequent on the expansion of production by the principal consuming industries, *viz.*, soap and paper. Since the close of the war, there has been no appreciable increase over the war time demand and the requirements of various industries in 1951 were estimated as follows:—

Soap	19,000 tons
Textiles	15,000 „
Paper	10,000 „
Vanaspati	1,700 „
Rayon	4,500 „
Miscellaneous	3,800 „
TOTAL	54,000 „

Assuming a production of 130,000 tons of soap in 1952-53 and 200,000 tons by 1955-56 and providing also for the increased demand to be envisaged as a result of the expansion of paper, textiles, rayon, aluminium and other alkali-consuming industries, the requirements of caustic soda may be placed at 58,000 tons in 1952-53 and at 87,000 tons by 1955-56.

II. Problems of the Industry

The main problem of the caustic soda industry is the high cost of domestic production which has led to the necessity to grant protection to this industry against foreign competition during normal times. These high costs are, however, closely inter-linked with the small sizes of the existing units, the comparatively high costs of power and the poor utilisation of chlorine in India so far. The low purity of industrial salt has also given rise to increasing costs of operation. Besides, the levy of a cess on all salt consumed in the country, including that used for industrial purposes, has also been adding to the cost of production of caustic soda.

Another problem militating against the expansion of the industry is the lack of adequate tank wagon facilities for transporting liquid chlorine and caustic soda in bulk to centres of consumption. The situation might become more acute with the expansion of the industry and early arrangements are necessary to provide the required facilities.

III. Programme of Development

(a) *Existing programme.*—The following plans have already been projected for securing additional capacity for caustic soda :—

Expansion plan for caustic soda industry

	(Number of working days 330 per annum)	
	1950-51 (Tons)	1952-5 (Tons)
Mettur Chemical and Industrial Corporation Ltd.	1,500	4,300
Alkali and Chemical Corporation of India Ltd.	2,000	4,500
Travancore-Mettur Chemicals	..	6,600
Hindustan Heavy Chemicals	..	2,000
D. C. M. Chemicals Works	2,100	6,600

As a result of the implementation of these projects the installed capacity for caustic soda would go up to 41,125 tons comprising of 35,125 tons by the electrolytic process and 6,000 tons by the chemical process. The production of caustic soda by the electrolytic process up to the full capacity mentioned above would simultaneously generate about 31,000 tons of chlorine.

(b) *Recommendations.*—(i) In spite of the expansion projects and new units projected so far, there will still be a substantial gap between the demand for caustic soda and the installed capacity envisaged by the end of 1952-53. Although a plausible method of bridging the gap consists in bringing additional capacity for caustic soda into existence, the problem is complicated by the fact that in the manufacture of electrolytic caustic soda, chlorine is simultaneously produced and its proper utilisation normally sets the limit for the expansion of caustic soda production by the electrolytic process. At present, the demand for chlorine in the country is still poor being only of the order of 9,000 to 10,000 tons per annum in the form of liquid chlorine, bleaching powder, bleach liquor and hydrochloric acid, all put together. Till means for its utilisation are developed both intensively and extensively it might not be desirable to let new electrolytic caustic soda plants to come into existence, unless such schemes also provide for utilisation of chlorine. A high priority has, therefore, to be given to all plans for chlorine utilisation such as the manufacture of D. D. T., manufacture of dicalcium phosphate using hydrochloric acid, manufacture of chlorinated rubber and chlorinated solvents, etc., so that secure foundations are laid as soon as possible for the development of the electrolytic caustic soda industry.

The existing manufacturers may, however, be allowed to expand their plants to larger sizes (15 to 20 tons of caustic soda per day) as such a step would help bring down the cost of production of caustic soda. Such expansion plans of existing manufacturers should in each case provide for full utilisation of the additional chlorine which would be simultaneously produced.

Even after providing for the expansion of each of the existing caustic soda plants to a capacity of 20 tons per day so as to make them of larger and more economic sizes, there will still be a gap of not less than 25,000 to 30,000 tons of caustic soda between the

estimated demand and the installed capacity by 1955-56. Suitable arrangements require to be made in the second part of the period of the Plan to bridge this gap and unless the increasing demand for chlorine justifies the installation of additional and larger electrolytic caustic soda plants, the chemical process based on causticisation of soda ash would have to be adopted. The schemes for the chemical process would, however, have to be regarded as part of projects for the manufacture of soda ash and, after suitable locations for economic production of soda ash are found as a result of fresh surveys, the manufacture of caustic soda by the chemical process should be integrated with additional soda ash production.

If investment conditions in the private sector do not improve and scarcity of capital continues, there might be no alternative but to meet the deficit by imports, which at the c.i.f. price of Rs. 23 per cwt. of caustic soda would require about Rs. 7·7 crores.

(ii) There are fairly large deposits of sodium sulphate associated with small quantities of other chemicals such as sodium carbonate at Didwana and Sambhar available as a by-product of salt manufacture. Such sources have been utilised in other countries for the production of soda ash and other heavy chemicals. The National Chemical Laboratory should investigate the possibility of exploiting such indigenous resources of sodium sulphate for producing caustic soda either by causticising sodium sulphate with lime or by developing suitable electrolytic processes.

The table below summarises the programme of development of the Caustic Soda Industry during the period of the Plan. This is exclusive of the units attached to paper mills in which the caustic soda and chlorine are directly consumed:—

	Unit	1950-51	1955-56
Number of factories	..	7	9
Annual rated capacity	Tons	18,725	37,125
Actual production	"	11,375	33,000

D. MISCELLANEOUS CHEMICALS

I. Brief Survey of the Industry

(a) *Rated capacity and Production.*—Although a large number of miscellaneous chemicals required by various industries were being imported in substantial quantities before the second world war, the manufacture of several of them was undertaken under the stimulus of war and the present position of some of the important products is as follows :—

	Number of units	Annual Production Capacity (Tons)	Actual Production (Tons)		
			1949	1950	1951
1. Alum	18	9,990	4,279	5,349	2,460
2. Aluminium sulphate (alumina ferric and aluminium sulphate, iron free).	19	39,000	15,408	18,923	19,350
3. Ferrous sulphate	12	2,238	670	599	612
4. Copper sulphate	9	1,720	450	437	505
5. Sodium thiosulphate	4	1,725	499	479	..
6. Sodium sulphite	2	420	74	163	204
7. Sodium bisulphite	3	735	117	270	271
8. Sodium sulphide	13	7,936	533	790	1,935
9. Bichromates	9	5,916	1,720	1,974	3,271
10. Sodium bicarbonate	2	3,440*	..	..	1,630
11. Potassium chlorate	2	2,200	2,200	2,200	1,593
12. Zinc chloride	2	690*	166	426	532
13. Calcium chloride	2	2,440	175	1,345	960
14. Magnesium chloride	3	18,200	10,373	4,011	3,639

* Estimated.

(b) *Imports and exports.*—The imports of some of the more important miscellaneous chemicals are as follows :—

(Quantity in tons and value in Rs. '000)

	1949-50		1950-51		1951-52	
	Quantity	Value	Quantity	Value	Quantity	Value
Alum	2	2·4	14·0	50·5	..	..
Aluminium sulphate	379	75·5	2,666	591·6	106.8	25·2
Ferrous sulphate	1	1·6	5	6·8	..	..
Copper sulphate	1,111	870·6	1,303	1,173·7	2,111	2,735·7
Sodium thiosulphate	275	130·2	16·3	32·3	13·2	57·0
Sodium sulphide	1,032	599·2	1,012	586·9	2,239·6	1,622·4
Bichromates	2	2	0·2	1·3	1·8	4·0
Sodium bicarbonate	4,026	1,172·5	1,798	503·2	9,674	3,509·8
Potassium chlorate	265	278·8	674	732	1,412	2,041·8
Zinc chloride	552	383·8	442	388·4	246	491·8
Calcium chloride	285	79	44·6	17·2	15·5	9·0
Magnesium chloride	0·9	2·1	..	..	..	..
*Sodium hydrosulphite	1,229	2,542·7	3,406	8,721	2,785·6	9,864
*Sodium cyanide	126	147·3	233	283·5	276·6	430
*Potassium cyanide	11	34·6	14	30·6	33·0	116
Anhydrous ammonia	102	333·6	93	288·1	131·0	407
Ammonium chloride	4,246	2,683·1	1,374	767·5	5,215·0	3,589
Ammonium carbonate and bicarbonate.	574	467·8	516	436·5	2,373	2,051
*Calcium carbide	10,274	5,311·3	4,533	2,303·7	9,849	6,722
Borax	1,769	739·0	1,552	743·5	7,549·7	3,995

(c) *Estimated consumption and requirements.*—Although the internal demand for many of these chemicals is not very large, many of them are essential for keeping several consumer goods industries in production. For instance, in comparison with the output of the match industry, the demand for potassium chlorate is negligible; but if this is not available, this essential industry will be completely paralysed. The same holds good in the case of sodium sulphide, and sodium bichromate in relation to the chrome-tanning industry; sodium thiosulphate in relation to photographic industry; and ammonium chloride in relation to the manufacture of dry cells.

* Not produced in the country. Exports of chemicals have been essentially confined to magnesium chloride and sodium bichromate. The quantities exported are of the order of 2,000 tons of magnesium chloride and 500 tons of sodium bichromate per annum.

The demand for some of the important miscellaneous chemicals is as follows:—

Alums and aluminium sulphate	25,000 tons per annum.
Ferrous sulphate	2,000 „ „
Copper sulphate	2,000 „ „
Sodium thiosulphate	800 „ „
Sodium sulphide	3,000 „ „
Bichromates	2,800 „ „
Sodium bicarbonate	6,000 „ „
Potassium chlorate	2,500 to 3,000 „ „
Zinc chloride	1,000 to 1,500 „ „
Calcium chloride	1,500 „ „
Magnesium chloride	2,000 to 4,000 „ „
Sodium hydrosulphite	2,500 to 3,000 „ „
Sodium and potassium cyanide	250 „ „
Anhydrous ammonia	200 „ „
*Ammonium chloride	4,000 „ „
Ammonium carbonate and bicarbonate	600 to 700 „ „
Calcium carbide	7,200 „ „
Borax	1,800 „ „

II. Problems of the Industry

The main problems of the industry are high costs and foreign competition. The high costs are generally due to small-sized units operating discontinuously and to the comparatively high costs of raw materials. Many of these products have been protected in the post-war period, but in spite of it, the scarcity of raw materials such as soda ash, sulphur and sulphuric acid have affected continuous operations.

III. Programme of Development

(a) *Existing programme*.—In the case of many of the chemicals mentioned above, there is either adequate installed capacity available in the country for meeting normal requirements, or it is possible to harness facilities for additional production without much difficulty, so that no definite plans of development are necessary. There are, however, a few schemes for the manufacture of certain chemicals which are not at present produced in the country.

(i) *Calcium Carbide*.—The dissolved acetylene industry requires annually about 7,200 tons of calcium carbide for producing acetylene necessary for oxy-acetylene welding, which plays an important role in several engineering industries. The manufacture of calcium carbide was undertaken on a small-scale in South India during the second world war and production has recommenced with the resumption in supply of power which was not

* This demand is apart from what is required for experimental trials as a fertiliser.

available for some time. Messrs. Birla Brothers Ltd., Calcutta, are setting up a plant near Asansol for the manufacture of calcium carbide with a capacity of 3,000 tons per annum. The plant is expected to come into production in 1953.

(ii) *Sodium Hydrosulphite.*—Although there is a demand of the order of 3,000 tons for sodium hydrosulphite mainly from the textile industry, no plant has so far been put up for the production of this chemical. Messrs. Bhagwan Lal Tejaji Karewala, Ahmedabad, have a scheme to set up a plant with a capacity of 1,800 tons of sodium hydrosulphite per annum. The plant is expected to be ready for operation by 1953.

(iii) *Ammonium Chloride.*—The Fertilisers & Chemicals Ltd. (FACT), have a scheme to set up a plant for the manufacture of ammonium chloride with an annual capacity of 3,000 tons. The plant is likely to be set up by 1953. Although the manufacture of ammonium chloride as proposed by FACT is intended for effecting supplies for use as an alternative nitrogenous fertiliser, a part of the output might be refined and made available to dry cell manufacturers.

(iv) *Manufacture of rare earth compounds.*—A project for the processing of the monazite sands of Travancore as a State enterprise with the joint participation of the Central Government and the Government of Travancore-Cochin was approved in 1949 and a Company under the name of Indian Rare Earth Ltd. was registered in August 1950. The Government of India and the Government of Travancore-Cochin have paid Rs. 27·5 lakhs and Rs. 22·5 lakhs respectively as their share of the capital for this State enterprise, and a Board of Directors consisting of the representatives of industry, the Government of Travancore-Cochin, the Central Government and a representative of Science and Scientific Research was constituted for running the Company. The development of the industry is based on an agreement for a period of 15 years with two French firms, namely. the Banque Maro-caine de Credit and Societe de Produits Chimiques des Terres Rares, who would set up in India a plant capable of processing 1,500 tons of monazite sand per annum. The plant would be operated by Indian scientists trained abroad for this purpose.

The expenditure on the factory up to the end of 1951 was Rs. 26 lakhs and as a result of the increasing cost of machinery and materials, the capital investment on the project is expected to go up to Rs. 80 lakhs. According to present arrangements, the additional capital requirements would also be provided by the Central Government and the Government of Travancore-Cochin.

The factory is under construction at Alwaye and it is expected to start production in the second half of 1952. The output of the various products envisaged to be manufactured by this factory are as under:—

(1) 800 tons of mixed rare earth compounds as chlorides or carbonates valued at about £700,000;

(2) 1,800 tons of trisodium phosphates;

(3) crude thorium oxide equivalent to 203 tons of thorium nitrate and 15 tons of uranium oxide; and

(4) 200 tons of dilute caustic soda solution which would be sold locally.

The development of this industry would result in this country becoming an exporter of some important basic chemicals in place of the mineral raw material which was being exported so far.

(b) *Recommendations.*—(i) Potassium chlorate is an important chemical required by the match industry and also in the manufacture of ammunition. As against the estimated requirements of 2,500 to 3,000 tons, the installed capacity of the plant of WIMCO LTD. is 1,800 tons per annum. Self-sufficiency in respect of potassium chlorate can be achieved if another plant of 5 tons daily capacity is established. The capital investment on a 5-ton plant would be of the order of Rs. 20-25 lakhs.

(ii) Manufacturers of miscellaneous chemicals should be helped to secure the required raw materials—both imported and domestic—so as to maintain the plants in full production.

(iii) In the case of protected industries, the quality of the products should be prescribed to safeguard consumer interests, such standards being evolved in consultation with producers and consumers.

The following table summarises the programme of development for important miscellaneous chemicals during the period of the Plan:—

Chemical	1950-51		1955-56	
	Annual rated capacity (Tons)	Actual production (Tons)	Annual rated capacity (Tons)	Actual production (Tons)
Sulphur	..	..	33,000	(*a*)
Potassium chlorate	2,200	2,000	3,800	3,500
Calcium carbide	..	..	3,000	3,000
Sodium hydrosulphite	..	..	1,800	1,500
Rare earth compounds	..	..	(*b*) 1,500	1,500

(*a*) Plant is expected to be ready towards the end of Plan period so that no production is visualised in 1955-56. When it goes into operation about 100,000 tons of cement will be annually produced in addition to sulphur.

(*b*) In terms of the quantity of monazite sand processed per annum.

24. DRUGS AND PHARMACEUTICALS

The drugs and pharmaceutical industry in India dates from the beginning of the present century when the Bengal Chemical and Pharmaceutical Works Ltd. was established under the guidance of the late Acharya P. C. Ray in the suburbs of Calcutta. Since that time it has developed in different parts of the country, but progress has been achieved only in certain directions. Unlike in other countries, where the industry has been developed for manufacturing not only the finished products in the form of tablets, injections, patent medicines, etc., but also the basic synthetic drugs starting from primary raw materials, in India, progress has so far been mainly in the direction of producing substitutes for imported patent medicines or manufacturing tablets and injectules from materials imported in bulk. It is only in recent years that efforts have been made to manufacture some synthetic drugs, but even in these cases, the tendency has been generally to manufacture them from imported penultimate products or intermediates necessary for the last stages of the manufacturing processes. The largest development has taken place in the manufacture of tinctures and galenicals. With the introduction of import control necessitated by balance of payment considerations in recent years, the tendency to import the finished drugs in bulk form and convert them into tablets, injectules or patent medicines by carrying out the finishing stages of manufacture in the country, both by Indian concerns as well as foreign concerns working alone or in collaboration with the former, has been on the increase. The above method of development has, no doubt, contributed to the springing up of a number of pharmaceutical establishments in the country but import of drugs from abroad has not diminished in any manner. With the coming into use of new drugs, such as. sulpha drugs, antibiotics, etc., in recent years, dependence on imports has, unfortunately, increased. There is thus a large scope for the development of the drugs and pharmaceutical industry on a proper basis in the country in the future years.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There are at present more than sixty comparatively important units engaged in manufacturing various types of drugs and medicinal preparations. They are mostly concentrated in Calcutta and Bombay and are about equally distributed between them. Madras, U. P. and Travancore-Cochin have two units each and Mysore and Punjab one each. About 40 of these factories produce tinctures, extracts and galenicals. The rated capacity of the more important units is estimated at 1,188,580 gallons per annum. This capacity is adequate to meet the demand for these products. Most of the crude drugs which are required for the preparation of tinctures and galenicals are available indigenously.

A section of the industry is engaged in the production of tablets and injectable drugs from materials imported in bulk. Its total capacity is estimated at nearly 88 million tablets and 9 million ampules of injectable drugs per month. This capacity could be expanded in case of greater demand without difficulty.

The Government have also established factories for the manufacture of a number of alkaloids. The country with its wide range of climatic conditions is favourably placed with respect to medicinal plants. There are two Government factories, one at Madras and the other in West Bengal, producing quinine from cinchona bark. Their total capacity is estimated at 90,000 lbs. of quinine per annum. Two factories in the private sector (Calcutta

Chemical Co., and Bengal Chemicals & Pharmaceutical Works, Calcutta) produce caffeine from tea waste and have a capacity of about 20,000 lbs. per annum. Their production in 1949 was however only 9,684 lbs. of caffeine citrate. The manufacture of opium alkaloids is the monopoly of the Government of India and they have an opium factory at Ghazipur for the production of morphine and other opium alkaloids. Ephedrine was formerly being manufactured at Quetta, but since partition, Messrs. May & Baker, Bombay, have been producing ephedrine from raw materials imported from Pakistan. Their production in 1949 was 2,208 lbs. Strychnine is produced by Messrs. Smith Stanistreet and the annual capacity is 15,000 lbs. of strychnine. The production in 1949 was 2,802 lbs., practically the whole of which was exported to Australia.

The manufacture of emetine was undertaken by Messrs. Bengal Chemicals & Pharmaceutical Works during the war when supplies were not available from abroad but, due to difficulty in securing raw materials at reasonable prices, its production was given up. There are other firms who are showing interest in undertaking its manufacture again in the country using imported materials.

Considerable quantities of glandular extracts are prepared in the country from animals slaughtered in the big cities. Although most of the animals handled in these slaughter houses are undernourished and of low quality, the amount of glandular material obtainable from them is adequate to meet the major part of the requirements of the country. Twenty-one firms are engaged in the production of liver extracts and they have a total annual capacity of about 23·8 million cc. of injectable liver extract and 1·4 million lbs. of oral liver extracts. The annual capacity for production of liquor adrenaline hydrochloride, liquor adrenaline tartrate and extract pituitary are 40 million cc., 44 million cc. and 55 million cc. respectively. There are four factories manufacturing these products.

There are five units for producing shark liver oil and their annual capacity has been placed at approximately 30,000 gallons per annum of oil equivalent to potency of 6,000 international units/gram. In terms of the estimated requirements of 30 million MIU in the country, the quantity which could be available even on the basis of utilising the total capacity for shark liver oil is exceedingly small. The actual production of shark liver oil in the existing units has been far below capacity so that it is not only necessary to make up the lag in production but also to facilitate the expansion of the capacity for shark liver oil.

In view of the importance of vaccines, anti-toxines and sera in combating bacterial infections, the Government have started a number of medical research laboratories for the preparation of these essential requirements of the country. In addition, a few private firms have also taken up the production of vaccines. The capacity of the private firms is nearly 5 million cc. per month and that of Government institutes, nearly 6 million cc. per month. The country is self-sufficient in regard to many sera and vaccines.

A number of patent medicines are also produced in the country. The manufacture of antibiotics and synthetic drugs, however, has not been taken up as yet. Carbarsone, a synthetic arsenical used for the treatment of amoebic dysentery, is produced by six firms. There are also a few schemes for the manufacture of sulpha drugs and anti-malarials. The Government of India in co-operation with UNICEF and WHO have drawn up a scheme for the establishment of a factory for the manufacture of penicillin.

(b) *Capital and labour.*—It is difficult to estimate the paid-up capital and labour force for the entire pharmaceutical industry. Some of the firms also produce heavy chemicals and separate figures for capital are not available.

(c) *Raw materials.*—The raw materials required by the drugs and pharmaceutical industry cover a wide field. In general, they consist of inorganic and organic chemicals, distillation products of coal, wood and petroleum, fermentation products and substances of vegetable and animal origin. Many common inorganic chemicals are indigenously produced, but a few elementary chemicals like sulphur, phosphorus, arsenic, antimony, etc., have to be imported. They are, however, required in the pharmaceutical industry only in small quantities and therefore their requirements can be generally met in full without difficulty from imports. Among organic chemicals, only a few simple compounds like ether, acetone, chloroform, etc., are at present produced in the country. The synthetic organic chemical industry is still undeveloped in India and therefore a multitude of synthetic organic chemicals required in the industry, though in small quantities, have still to be imported. Although coal distillation is carried out to a considerable extent to produce metallurgical coal, the coal-tar distillates are only produced in small quantities. Only one factory in Mysore is engaged in the recovery of methyl alcohol, acetone and acetic acid from wood distillation. In view of the high cost of recovering these chemicals from wood distillation, they are produced synthetically in industrially advanced countries, but no such plant has yet been put up in India. The resources of petroleum being very meagre, the requirements of the pharmaceutical industry for petroleum distillation products like petroleum ether and white mineral oil are largely met by imports. Of the many fermentation products like ethyl, butyl, and amyl alcohols, lactic, butyric, gluconic and citric acids and acetone, only ethyl alcohol is prepared in large quantities by fermentation. Raw materials of vegetable and animal origin required in the pharmaceutical industry are abundantly available. About 75 per cent. of the vegetable drugs mentioned in the British Pharmacopea can be prepared from plants grown in India. Similarly, the tissues and glands of animals slaughtered in the big cities, if properly collected, could be sufficient to meet the requirements of the country.

With the loss of the resources of the West Punjab (Pakistan) arrangements for collection of artemesia from possible new sources in the hilly regions of Himachal Pradesh, PEPSU and Western U. P. require to be looked into, since the quantity available from Kashmir is limited and uncertain.

A number of organic compounds such as acetyl salicylic acid, phenacetin, etc., are consumed in considerable quantities by the indigenous pharmaceutical industry. These materials have not so far been produced in the country.

(d) *Imports and exports.*—Considerable quantities of drugs and medicines are imported every year. While the total annual value of these imports was about Rs. 8 crores in 1948-49 and 1949-50, and Rs. 10 crores in 1950-51, it was nearly Rs. 15 crores in 1951-52. Penicillin, sulpha drugs, vitamins, streptomycin, quinine salts and patent medicines account for the major portion of these imports. It is estimated that the total value of penicillin imported from the U. S. A. in 1951 was of the order of Rs. 120 lakhs, sulpha drugs Rs. 15 lakhs, vitamins Rs. 68 lakhs and streptomycin Rs. 139 lakhs. By the proper development of the production of penicillin, shark liver oil, sulpha drugs and quinine, these imports could be considerably reduced, if not completely stopped.

Exports are confined to crude drugs and a few raw materials of drugs. The total value of exports was nearly Rs. 80 lakhs in 1948-49 and 1949-50, Rs. 118 lakhs in 1950-51 and Rs. 211 lakhs in 1951-52.

The tariff duty for drugs and chemicals is 26 per cent. *ad valorem* from the U. K. and the British Colonies and 36 per cent. *ad valorem* from the U. S. A. This applies to both

raw materials and finished products. The high duty on raw materials appears to be in some cases responsible for the high cost of production of indigenous products.

(e) *Estimated consumption and requirements*:—The annual consumption of some of the important synthetic drugs in 1952 and during the period of the Plan is estimated as follows: —

(1) Penicillin	8·0 million mega units
(2) Streptomycin	6·6 million grams
(3) Sulphadiazine and derivatives	296,000 lbs.
(4) Sulphathiazole and derivatives	224,000 lbs.
(5) Sulphanilamide, sulphaguanidine and other sulphanamide drugs . .	224,000 lbs.
(6) D. D. T.	1,500 tons rising to 5,000 tons
(7) Benzene hexachloride	2,400 tons

The demand would, however, be likely to go up considerably, if these drugs could be had at cheaper rates and if medical facilities are provided more abundantly.

II. Problems of the Industry

(i) *Supply of alcohol*.—The manufacturers of pharmaceutical preparations have to face considerable difficulty on account of State excise barriers and different excise duties in different States. The Indian manufacturers are placed in a disadvantageous position with respect to excise duty, because imported preparations containing alcohol are free for inter-State transport once the duty is paid at the port. In order to mitigate the difficulty of the pharmaceutical industry, the Government have to consider the possibility of abolishing the disparity in excise duties in different States. Early action on the Report of the Expert Committee appointed to make necessary recommendations would assist the pharmaceutical industry. An early decision on the issue of the rate of excise duty leviable on non-potable alcohols such as methanol, butyl alcohol, etc., which at present are being treated *at par* with the potable ethyl alcohol appears to be necessary.

(ii) *Supply of raw materials*.—The short supply of adequate quantities of solvents, crude drugs and intermediate chemicals is a serious handicap to the industry. Heavy chemicals required for the industry can largely be met out of indigenous production; but the prices ruling are higher than those prevailing in other countries. Almost all the intermediate chemicals required in the manufacture of drugs have to be imported. Considerable difficulty is also experienced in obtaining from Pakistan crude drugs essential for the production of ephedrine and santonine for which there is sufficient capacity in this country. Necessary steps should be taken for facilitating the availability of imported intermediates and raw materials.

III. Programme of Development

The Panel of Fine Chemicals and Pharmaceuticals in its report (1947) had fixed targets for a large number of drugs and allied chemicals after taking into consideration the conditions existing in the immediate post-war period. In view of the altered conditions brought about by partition and other factors, these targets were re-examined by the Development Committee for Fine Chemicals and Pharmaceuticals in September, 1949. The Committee was of the

opinion that the long-term targets fixed by the Panel could not be achieved in many cases because of the fall in demand and the non-availability of some of the essential raw materials. However, it was recommended that the targets might be kept in view as a general indication of the direction in which expansion should be planned. In the case of some items, for example, liver extracts, the capacity has very nearly reached the long-term target. Although it may be difficult to become entirely self-sufficient in all the requirements of drugs and medicines, the development of many of these should be possible through the implementation of some projects in the public and private sectors.

(a) *Existing programme*—(i) *Penicillin.*—The importance of penicillin for the control of bacterial infections has been widely recognised. The present annual consumption is estimated at 8·0 million mega units per annum and it is wholly imported. The vast majority of patients needing penicillin could not at one time obtain it on account of its high price and the necessity for hospitalization for its application. If sufficient quantities are made available at cheaper rates, a larger section of the population will be able to take advantage of this valuable drug. The Government of India have entered into an agreement with the United Nations International Children's Emergency Fund (UNICEF) and World Health Organisation (WHO) to set up a factory for the manufacture of penicillin and other antibiotics. The total cost of the project is estimated at about Rs. 211 lakhs. Financial assistance to the extent of $1,200,000 will be available from WHO and UNICEF in the form of equipment and technical assistance. UNICEF has agreed to furnish all essential imported equipment up to the value of $850,000 and WHO will provide all necessary technical knowledge and technical personnel for operating guidance and also arrange the training of persons who would ultimately take complete control of the plant. The cost of the technical personnel and the training scheme amounting to $350,000 is to be borne by WHO.

It is estimated that with the equipment provided by UNICEF and the technical assistance given by WHO, penicillin will be produced on a scale, which will reach through successive stages, the ultimate target of 750,000 mega units per month, although the present programme is based on a production of 400,000 mega units only per month. The penicillin will be produced and distributed entirely on a non-profit basis. Provision has also been made for the development of an important centre of research and training in the antibiotics field. Production is expected to begin by the end of 1953 and to be stepped up to full capacity of 400,000 mega units per month by the end of 1954. The plant will be located at Pimpri near Poona in Bombay State and will require 3,000 K.W. of power.

Among the other antibiotics, a scheme for the manufacture of chloromycetin (chloramphenicol) has already been taken up by Messrs. Park Davis. A scheme for the manufacture of auromycin is under development by Messrs. Atul Products (India) Ltd. There are also schemes for the manufacture of streptomycine in the country. Considering that other antibiotics, such as terramycine, are also finding increasing uses, the possibility of manufacturing these synthetic drugs also either under the auspices of the Indian Penicillin Factory or by others if suitable facilities exist with them, requires to be considered.

(ii) *Benzene hexachloride.*—There is still no production of benzene hexachloride in the country. Messrs. Alkali and Chemical Corporation Ltd. (ICI) are putting up a plant for producing 500 tons per annum of benzene hexachloride in their factory at Rishra near Calcutta. The plant is expected to go into full production by 1953. Another proposal for undertaking the manufacture of nearly 1,500 tons of benzene hexachloride as an adjunct of caustic soda chlorine manufacture is also under consideration and the prospects of its materialising during the period of the Plan appear to be bright.

(iii) *Sulpha drugs.*—Atul Products Ltd. have planned a modern factory for the manufacture of pharmaceuticals and dyestuffs at Bulsar in Bombay State in collaboration with the American Cyanamid Co. of New York who have agreed to take 10 per cent. of the share capital apart from providing technical assistance. The present investment is about Rs. 1·5 crores. The manufacturing programme of Atul Products envisages the production of 250,000 lbs. of sulpha drugs, sulphathiazol and sulphadiazine per annum and of auromycin and folic acid. The initial production capacity for sulphur drugs is estimated at 100,000 lbs. The dyestuff section of the factory would produce 4 million pounds of dyes. The sulpha drugs plant went into production in March, 1952. Another firm, May & Baker, has also planned to manufacture sulpha drugs before the end of 1952. Both these projects are based on the processing of imported intermediates to start with. In due course it is desirable to achieve the objective of manufacturing sulpha drugs from indigenous intermediates whose production also might be integrated, if possible, in the same units.

Other synthetic drugs.—In addition to the establishment of the manufacture of the substituted quinolines, arsenicals and antimonial drugs, the manufacture of sulphone drugs for the treatment of leprosy, thiosemicarbozone for the treatment of leprosy and tuberculosis and para-amino salicylic acid for the treatment of tuberculosis has been undertaken in the country by one or more firms. The production of nicotonic acid and nikethamide has also been started. A scheme for the manufacture of about 50-75 tons of paludrine in the country has already been envisaged and production is expected to be achieved within the period of the Plan.

The new anti-tubercular drug—isoniazide(isonicotenyl-hydrozide)—simultaneously developed both by Messrs. Hoffmann Le Roche and by Squibbs for use in the treatment of tuberculosis has been recently released for use in the country after necessary clinical trials. In addition to importing the drug from abroad at the lowest prices for meeting immediate requirements, a number of firms in the country have also evinced interest in manufacturing it from basic raw materials or intermediates, supplies of which can be procured locally or imported from time to time. It is hoped that sufficient production capacity will be available in the country as demand increases.

(b) *Projects yet to be implemented*—(i) *D. D. T.*—The demand for D. D. T. has been variously estimated. Whereas the Panel on Fine Chemicals, Drugs and Pharmaceuticals (1947) had fixed a target production of 30,000 tons of D. D. T. per annum, more recent estimates have placed the annual demand for D. D. T. on the basis of its extensive application for malaria control in the country at only 10,000 tons. Further, on the basis of utilising D. D. T. and benzene hexachloride (gemmaxane) simultaneously in the country for the control of malaria and for other insecticidal purposes, an annual production of 5,000 tons of both per annum has been deemed to be sufficient during the period of the Plan.

The present consumption of D. D. T., however, is estimated to be only about 1,500 tons per annum although it is expected to expand to 5,000 tons by 1955-56. There is at present a proposal under consideration for the setting up of a factory for the production of 700 tons of D. D. T. per annum with the technical and financial assistance of WHO and UNICEF. The former has agreed to furnish plant and equipment of the value of $250,000 and the latter to provide technical assistant involving an expenditure of $100,000. The total capital investment is estimated at about Rs. 39·1 lakhs. It has been decided to set up the factory at Delhi and it is expected to go into production by 1954.

(ii) *Quinine.*—Quinine is produced at present by the Governments of West Bengal and Madras who own cinchona plantations and factories. The total production is about 100,000 lbs. a year against an annual estimated consumption of 150,000 lbs., in India. The balance is met by the import of quinine salts. In addition, synthetic antimalarial drugs like paludrine are imported. The Madras Government are reported to have under consideration certain plans for increasing quinine production.

(iii) *Para-amino salicylic acid.*—This is a specific for tuberculosis and its production in this country should, therefore, be encouraged. It is understood that a proposal of Messrs. Nivea Pharmaceuticals, Calcutta, to produce this drug in collaboration with foreign firms has already been approved by the Government. The production of these plants, when installed, will be about 48 tons per annum.

(iv) *Insulin.*—Insulin is an important drug imported in considerable quantities for the treatment of diabetes. It is reported that Sarabai Chemicals have under consideration a project for manufacturing insulin with foreign technical assistance.

As a result of the completion of the schemes under implementation and the materialisation of the projects under consideration relating to D.D.T. and quinine, the following quantities of certain drugs are envisaged to become available during the period of the Plan:—

	Sulpha Drugs ('000 lbs.)	Penicillin (million mega units)	D.D.T. (Tons)	Benzene Hexachloride (Tons)	Quinine (lbs.)
1951-52	..	..	..	..	100,000
1952-53	120	..	..	..	100,000
1953-54	200	1·0	..	500	150,000
1954-55	300	4·0	600	500	150,000
1955-56	400	4·8	700	500	150,000

(c) *Imports during 1951-56.*—For effective implementation of health programmes, and for measures for the treatment of cereals against deterioration during storage, and for control of locusts, pests, etc., increasing quantities of pharmaceuticals, drugs, etc., will be needed in future years and, consistent with the need for fostering the manufacture of new products in their infant stage through protection, etc., provision has to be made for importing adequate quantities of the required materials. It is visualised that such imports including raw materials of the industry would be of the order of Rs. 10·0 crores per annum during the period of the Plan.

(d) *Recommendations.*—Certain deficiencies in the development of the pharmaceutical industry in the country have already been discussed. In planning future progress the following matters should be taken into consideration so as to establish the industry on a proper basis:—

(i) Efforts should be made by all the existing manufacturers and newcomers to manufacture as many pharmaceutical chemicals and drugs as possible using basic chemicals and/or simple intermediates which may either be imported or produced locally according to circumstances. Whenever penultimate products and complex intermediates are used in the first instance to start the inndustry, efforts should be directed towards manufacturing such product within the country as soon as possible.

(ii) Higher priority should be given to the manufacture of synthetic drugs on the above lines than to the conversion of imported drugs into tablets or finished preparations for use, since capacity for the latter, even when it becomes inadequate, could be easily arranged.

(iii) It is necessary, particularly in the pharmaceutical industry, to put emphasis on quality rather than on volume of production. Standardisation of products and distribution of only ethical goods should be enforced as far as possible.

(iv) Considering that the products of the drugs and pharmaceutical industry are essential for the well-being of the nation and for alleviating human suffering, steps should be taken to bring down the cost of such materials as much as possible. The recent tendency prevalent among some manufacturers to undertake development by associating a number of related companies together which only tends to increase the cost of the products, should be discouraged.

(v) Although the production of shark liver oil is being carried out under the auspices of some Government Departments and also by some private agencies, the fishing of shark and extraction of oil have not developed on proper lines. The Fisheries Departments of different maritime States should cooperate with each other and coordinate their activities. Refrigeration facilities are also necessary at important centres of fishing.

On account of the bad odour and taste of shark liver oil, it is sometimes not acceptable to certain sections of the people. The vitamin content of the oil free from disagreeable odours could, however, be prepared in a concentrated form by molecular distillation. Units for deodorising and improving the taste of the oil should be established in important centres of production. The incapsulating of such shark liver oil in gelatin capsules will also mitigate to a large extent the bad odour and taste of the oil.

(vi) *Standards for drugs and chemicals.*—The manufacture and sale of drugs are now controlled by the Drugs Act. Specific standards should be vigorously enforced to check the growth of spurious and injurious preparations and facilities for the testing of drugs should be expanded. This would help in the substitution of imported drugs by indigenous products of established and certified purity and standards.

(vii) *Arrangements for collection of animal tissues.*—At present, there is no arrangement for the collection of animal tissues and glands under hygienic conditions for the production of biological products. The Ministry of Commerce and Industry is understood to have taken up the question of arranging cold storage facilities in slaughter houses with the State Governments. Early steps have to be taken to provide these facilities at least at some of the big cities.

25. PAINTS AND VARNISHES

Paints, varnishes and allied products have become essential to modern industry and have assumed great importance as regular items of civilised life. The paint industry in this country had its beginning in 1902 when the first modern paint factory was set up near Calcutta. Since then it has grown considerably both in volume and variety of products manufactured so that it is now in a position to meet domestic requirements fully in almost the entire range and has a surplus productive capacity.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There are, at present, at least 150 factories engaged in the production of paints, varnishes and enamels but as many as 100 of them are very small in size. The 50 major units are largely concentrated in Calcutta and Bombay. There are 18 units with a total annual capacity of 36,360 tons in Calcutta and 17 units with an annual capacity of 19,860 tons in Bombay, while in all other parts of the country put together, there are 15 units having a capacity of 8,580 tons per annum. The total installed capacity of the 50 major units is of the order of 65,000 tons on the basis of a double shift working for 300 days per annum.

The units vary considerably in size. For instance in Calcutta 7 units, each having an installed capacity of 3,000 tons and above per annum, account for 25,500 tons and in Bombay 2 units of the same category account for 6,900 tons. Units of an annual installed capacity between 1,500 and 3,000 tons number 9 in the whole country (Calcutta 4 and Bombay 4 and U. P. 1) and account for 16,920 tons per annum. The remaining 32 units together have an annual installed capacity of 15,480 tons.

A wide range of products are produced by the paint industry. Taking only the important manufacturers into consideration a maximum production of 38,602 tons was achieved in the year 1947. Since then the production has shown a steady decline, the output in the years 1948 and 1949 having been only 35,725 tons and 30,929 tons respectively. The production in the year 1950 was even less, being only about 28,000 tons but this went up to 33,484 tons in 1951. The low volume of production should not, however, be regarded as a sign of the stagnation of the industry because a wide range of high quality paints and lacquers based on new raw materials and capable of producing superior effects have been produced in recent years.

(b) *Capital and labour.*—On account of the existence of a large number of small units scattered all over the country, it is difficult to arrive at a correct estimate of the capital invested and labour employed in the paint industry. It is, however, estimated that the amount of capital invested in the industry is of the order of Rs. 300 lakhs. The labour employed is estimated to be about 6,000. Technical personnel engaged in the industry number about 200.

(c) *Raw materials.*—The raw materials cover a wide range of substances consisting of natural and synthetic pigments and extenders, drying oils and driers, resins, solvents and thinners. The country is rich in many of the required raw materials. Linseed oil, an important paint vehicle, is available in abundance. A variety of natural pigments are also available. Barytes, which is used for increasing the bulk of paints (an extender) on account of its cheapness, occurs in various parts of the country and it is of sufficiently good quality for the paint industry. Synthetic-oxide of iron pigments are produced as by-product of the pickling industry. Ilmenite from which titanium dioxide pigment is already

being manufactured occurs in abundance along the Travancore beaches. Other minerals like china-clay, bauxite, gypsum, asbestine, kieselguhr, magnesite, red and yellow ochres are also distributed in different parts of the country. Rosin, shellac and estergum are produced in sufficient quantities to meet the demand of the paint industry. Cashew-shell oil, bees wax, casein, turpentine, denatured spirit and many other raw materials of the paint industry are available indigenously.

Two firms—Messrs. Waldie Zinc Pigments Ltd. and Associated Pigments Ltd.—are engaged in the manufacture of lead and zinc pigments from imported metals. Their total production during the last four years is given below:—

Production of Zinc and Lead pigments

	(Quantity in tons)			
	1948	1949	1950	1951
Zinc oxide	5,405	3,268	4,447	4,837
White lead	1,623	963	1,218	821
Red lead	2,923	1,730	3,025	2,830
Litharge	648	473	774	830

Out of the total quantity of zinc oxide shown above, only about 60 per cent. is used in the manufacture of paints, the rest being used in the tyre and rubber industry and in the manufacture of cables, pharmaceuticals, etc.

There are, however, a few important raw materials which are in short supply and have to be supplemented by imports. Light solvent naphtha, which is produced by the Indian Iron and Steel Co. and the Tata Iron and Steel Co., is not available in adequate quantities. Both the steel manufacturers, however, have plans of expansion which, when implemented, will go a long way towards curtailing the shortage of solvent naphtha. Tung oil, which is an important vehicle, is also not available in sufficient quantities from indigenous sources. The production of tung oil could be increased if tea plantation interests in Assam would take an active interest in the cultivation of tung seeds. This aspect is already engaging the attention of the Indian Oilseeds Committee. On the other hand Congo Copal gilsonite, lithopone, pigment dyestuffs, ultramarine blue, carbon black, antifouling toxics, certain types of synthetic resins, nitrocellulose plasticisers and special solvents have to be imported.

(d) *Imports and exports.*—Substantial quantities of pigments, particularly those of lead and zinc, turpentine, varnishes and lacquers, were imported in the past, but in recent years, the volume of imports has shown a decline. Whereas the total value of paints and painters' materials imported amounted to Rs. 225 lakhs in 1948-49, it declined to Rs. 177 lakhs in 1949-50, Rs. 108 lakhs in 1950-51 but went up to Rs. 262 lakhs in 1951-52 Imports of paints alone in terms of quantity are as under:—

1947-48	1948-49	1949-50	1950-51
3,139 tons	2,760 tons	2,237 tons	963 tons

The industry has not so far been able to develop a good export market for its products. The loss of the Pakistan market due to the trade deadlock has seriously handicapped the industry. In other countries Indian products are not in great demand due to severe competition from other established manufacturers. The refund of import duty on raw materials used in the manufacture of exported paints is likely to enable the indigenous manufacturers to compete on even terms in foreign markets. The total value of exports amounted to Rs. 62 lakhs in 1948-49, Rs. 33 lakhs in 1949-50, Rs. 17 lakhs in 1950-51 and Rs. 68 lakhs in 1951-52.

(e) *Estimated consumption and requirements.*—The Railways and the Engineering industries including shipbuilding are the most important consumers of paints. On the basis of present production and imports, it is estimated that the demand for paints is roughly of the order of 35,000 to 40,000 tons. In view of the all-round development of industries envisaged in the period of the Plan, particularly the shipbuilding, railway carriage, automobile, bicycle, electrical equipment and other paint-consuming industries, as well as the increasing recognition of the value of paint as a protective agent in the building trade, etc., the demand for paints is expected to increase to 60,000 tons per annum by 1955-56.

II. Problems of the Industry

(1) *Fall in demand.*—The fall in production in recent years is mainly attributed to lack of adequate demand for indigenous paints and varnishes. Although it is difficult to specify the extent to which each of the various factors has been responsible for the drop in demand it can safely be said that the loss of the Pakistan market and the rising cost of raw materials have contributed considerably thereto. With improved trade relations with Pakistan, it should not be impossible to re-establish the market in that country. The simplified system of granting import licences also should help the industry in the easy procurement of imported raw materials.

(2) *Competition from inferior paints.*—The standard paint manufacturers find it difficult to compete with mushroom factories producing cheap substitutes of inferior quality. The measures taken by the Government purchasing organisation to buy paints according to ISI specifications will help the industry considerably in maintaining standards of quality. The quality of paints can also be maintained properly if the sale of paints by volume is introduced in place of sale by weight.

(3) *Transport difficulties and container shortage.*—Some difficulty was experienced in the movement of paints on account of the serious bottleneck in railway transport. The shortage of containers on account of the non-availability of steel and tinplate has also handicapped the paint industry to some extent. Improvement of transport facilities and adequate supply of tinplates can be visualised only on a long-term basis and no immediate remedial measures can be suggested.

III. Programme of Development

(a) *Existing programme.*—A few new factories are being established and some of the existing ones have taken up expansion schemes to raise the output and increase the variety of products. The new developments are essentially in the field of nitrocellulose lacquers, aluminium powder and pastes and titanium pigments. Some of the important projects under implementation are mentioned below :—

(i) Messrs. Addison's Paints and Chemicals have already started the production of nitrocellulose lacquers of satisfactory quality. Their capacity is reported to be 12,000 gallons per month and their capital outlay is estimated at Rs. 35 lakhs.

(ii) Messrs. Alkali & Chemical Corporation of India Ltd., a subsidiary of Imperial Chemical Industries (India) Ltd., have undertaken a project for the manufacture of nitrocellulose lacquers and synthetic finishes and have recently gone into production. The plant is designed for a capacity of 200,000 gallons per annum and is estimated to cost about Rs. 20 lakhs.

(iii) Messrs. Travancore Titanium Products Ltd. have been established with the object of manufacturing titanium dioxide pigments from ilmenite. Their capital is Rs. 75 lakhs of which the State has contributed to the extent of 51 per cent. The factory with a capacity of 1,800 tons of titanium dioxide per annum went into production in September 1951. It is under the technical direction of British Titan Products Co. Ltd., which has constituted a small company known as the Indian Titan Products Ltd. to function as the Managing Agents of the new concern.

(iv) Messrs. Indian Aluminium Company Ltd. have acquired a factory for the production of Aluminium paste and powder pigment. It has recently gone into production and has a capacity of 500 tons per annum. The Company expects to expand the capacity to 750 tons per annum by the end of 1955. The capital invested in the project is between Rs. 3 lakhs and Rs. 4 lakhs.

(v) Messrs. Gondwana Paints and Minerals (M. P.) have erected a factory for the manufacture of ordinary ready-mixed paints. The scheme is expected to cost about Rs. 15 lakhs. The Madhya Pradesh Government have undertaken to subscribe 20 per cent. of the issued and subscribed capital. The factory went into full production in 1952.

(b) *Recommendations.*—The Panel on paints and varnishes (1945) after taking into account the probable increased requirements of the country and the possibility of developing a wide export market recommended that the five-year target for paints and enamels should be 100,000 tons per year. The Panel also estimated that out of the increased production about 25,000 tons would be available for export. The Development Committee which subsequently reviewed the position of the Industry in 1949 did not fix any quantitative target of production, as it felt that it was difficult to stipulate any such target because the capacity of the paint industry varies with the quality of manufacture. In any case, it would be difficult to achieve the target of 100,000 tons of paints per year during the period of the Plan especially in view of the shrinkage of the market due to partition. The existing capacity will be able to meet the anticipated internal demand of 60,000 tons of paints by 1955-56 and also provide for export requirements. It is therefore not considered necessary to establish any new units except in cases where new types of product are going to be manufactured. Even in regard to new products the existing manufacturers might be able to produce them with a smaller capital investment than would be required by an entirely new plant. The industry should, therefore, concentrate its efforts on fuller utilisation of the existing capacity on production of new and improved varieties of paints, on reducing the cost of production and improving the quality of their products.

The following table summarises the programme of development of the paint and varnish industry during the period of the Plan:—

		1950-51		1955-56	
	Unit	Annual rated capacity	Actual production	Annual rated capacity	Actual production
(i) Titanium dioxide	Tons	..	..	1,800	1,800
(ii) Nitrocellulose lacquers	Gallons	..	..	350,000	300,000
(iii) Ready-mixed paints, enamels	Tons	65,000*	28,975*	70,000	60,000
(v) Aluminium paste and powder	,,	..	..	750	750

*Capacity and production of major units only

26. SOAP

The soap industry developed during the inter-war years without protection. Consumption of soap increased from about 35,000 tons in 1919 to over 70,000 tons in 1938-39, and imports went down from over 23,000 tons in 1929-30 to only a few thousand tons just before the outbreak of the second world war. Indigenous production of soap increased from 14,000 tons in 1913-14 to 70,000 tons in 1938-39. The demand for soap during the war gave a considerable fillip to the soap industry and by 1948 a production of 108,000 tons was attained. Since then there has been a slight decline in production. The total installed capacity of all the units in the soap industry is estimated today to be about 265,000 tons per annum and imports of soap are restricted to a few hundred tons of medicinal and special qualities not manufactured in the country. The use of soap in urban areas, so essential for healthy and clean living, is becoming fairly widespread.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—In the soap industry, there are three classes of units, large, small and cottage scale. Whereas the cottage-scale factories are distributed all over the country, organised production by large-scale units is, to a great extent, concentrated in and around Bombay and Calcutta. The capacity in 1951 was estimated to be about 265,000 tons per annum, made up of 192,000 tons produced by large- and small-scale factories and 73,000 tons by cottage units. The position has not changed to any significant extent since then. The large factories produce full-boiled, settled washing soaps and milled toilet soaps and are generally attached to oil mills and refineries or hydrogenation plants so as to take advantage of the cheap soap stocks available in such units. The medium-sized soap factories work as separate units and manufacture soap by the semi-boiled or cold process. In contrast to the modern up-to-date equipment used for producing soaps of standard specifications in the large factories, the medium-sized units do not possess adequate equipment and their products are not of a superior quality. The latter also purchase raw oil from the producers and do not have access to cheap soap stocks of the refineries or hydrogenation plants. The small factories produce filled cold process soaps only. They are run on a cottage industry basis using obsolete technique and produce low grade soaps. Further, the standard of their products is not uniform. But they claim to meet the demand for the cheaper varieties of soaps and form a useful section of the soap industry under existing conditions.

Of the large-scale manufacturers, the more important units are those of Lever Brothers and the Tata Oil Mills Company, each of which has more than one unit. Between them, they account for nearly 37·5 per cent. of the total capacity of the large-scale industry. The industry is mainly in the private sector. Although some of the State Governments such as those of Mysore and Madras own and run soap factories, the capacity of such units is not large and their output forms only a small portion of the total production of the industry.

The production of different categories of soap by organised factories during the last three years was as follows:—

Year	Washing (tons)	Toilet (tons)	Medicated (tons)	Others (tons)	Total (tons)
1949	57,249	13,206	249	1,263	71,967
1950	59,672	11,935	209	884	72,700
1951	67,155	14,894	204	1,183	83,436

Besides, small-scale and cottage units are estimated to have produced about 30,000 tons of soap. Hence, the total production of soap during 1949 and 1950 was of the order of 100,000 tons, and has shown a slight increase in 1951.

(b) *Capital and labour.*—According to the Census of Manufactures, the fixed capital invested by the large factories was Rs. 2·31 crores in 1950 and the labour employed in the same year was estimated at about 5,000. It has not been possible to assess the capital investment of the unorganised sector of the industry.

(c) *Raw materials.*—The main raw materials required by the industry are vegetable oils, fats and caustic soda. The better types of soaps require also small quantities of essential oils and aromatic products, rosin, soap colours, etc., while sodium silicate and other fillers are consumed in the manufacture of washing and inferior soaps. Common salt is also required by the industry, but in the larger factories the bulk of the quantity used is recovered and used again. The approximate quantities of the principal raw materials required for the production of 100 tons of soap are as under: —

Oils and fats	61 tons
Caustic soda	14 ,,
Rosin	9 ,,
Fillers	7 ,,

The above figures should be taken as approximate indications only since the quantities vary according to the type and quality of soap manufactured and the kind of raw materials, particularly the specific oils or fats, utilised.

(d) *Imports and exports.*—Import of soap during recent years has been insignificant. It has been restricted to soaps of medicinal or special quality. Small quantities of soap are exported to neighbouring countries, particularly Pakistan and Iraq. The prospects of expanding the exports do not seem to be bright unless the cost of production of soap is considerably reduced.

(e) *Estimated consumption and requirements.*—As already mentioned, after a period of rising consumption there has been a slight falling off in the demand in the last few years. During the war years, the large increase in the demand was primarily due to the increased off-take by the Defence Services. The smaller off-take for Defence purposes at present and the loss of the Pakistan market consequent on partition have been the main cause of the fall in demand. The present *per capita* consumption of soap in India is very low being only about 10 ounces, compared with 300 to 400 ounces in some of the western countries. The consumption of soap depends on the standard of living of the people. The low consumption of soap in India is due partly to the present economic conditions and also to the fact that a large number of people still use natural cleansing agents instead of soap. The availability of soap is expected to go up to 200,000 tons by 1955-56, which will ensure a *per capita* consumption of the order of 15 oz. after providing about 10,000 tons of soap for export.

II. Problems of the Industry

The main problem of the industry is that of expanding the demand for soap. Such increased demand can come from the development of the domestic as well as the export market. In both cases, however, the high price of the product has been an impeding factor. In recent years the prices of raw materials—*e.g.*, groundnut oil, cocoanut oil and other substitute oils—have gone up and they have also not been available in sufficient

quantities. The production of copra and cocoanut oil in India is not adequate and consequently, the industry has to depend on imports to a large extent. The levy of export duties on cocoanut oil and copra by some countries has added to the price of the imported product, and, in order to assist the domestic oil industry, certain revenue duties have also been imposed on imported oil by the Government. Until recently, imports of oil were available only in restricted quantities mainly because of the overall shortage of cocoanut oil in the world. From time to time there have also been difficulties in obtaining regular and adequate supplies of caustic soda, since domestic production is still far short of the demand. The high price of caustic soda has also contributed to increasing the price of soap.

These difficulties could be overcome *inter alia* by:—

(i) stepping up the production of copra and cocoanut oil in the country by increasing the area under cocoanut cultivation and by increasing the yield per tree by intensive cultivation ;

(ii) utilising substitute oils recovered from neem, karanjia and pisa which are not required for edible purposes. With proper organisation, it should be possible to produce sufficient quantities of these oils for meeting considerable portions of the requirements of the soap industry.

These questions should engage the attention of the Indian Central Cocoanut and Oilseed Committees and the National Chemical Laboratory.

III. Programme of Development

(a) *Existing programme.*—The Panel on Oil and Soap Industries (1947) fixed a production target of 300,000 tons of soap per annum and the establishment of new units and expansion of existing ones were projected on this basis. In the post-war period ending March 1951, additional capacity equivalent to 16,340 tons came into existence through the establishment of four new units and expansion of two existing factories. Since then two factories (Best & Co., Ltd., Madras, and Vermani Industries Ltd., New Delhi) have gone into production increasing the capacity further by 6,750 tons per annum. The following are the schemes under implementation at the present time:—

Expansion schemes for Soap

	Annual capacity
Dilawar Syndicate Ltd., Saurashtra	1,200 tons
Swathi Oil Mills Ltd., Pollachi, Madras	2,100 ,,
Vegetable Oil Products, Pollachi, Madras	720 ,,
Rohtas Industries, Dalmianagar	1,200 ,,
Expansion of soap production by Lever Brothers Ltd., Bombay	2,700 ,,

As a result of the completion of the above programme, the capacity of the soap industry will expand by about another 8,000 tons. On a review of the developments mentioned above, it will be seen that the capacity of the soap industry would nearly reach the target set by the Panel. In view of the difficulties experienced by the industry in utilising to the full the existing productive capacity, it is not considered necessary in ordinary circumstances to allow additional capacity to come into existence.

Two of the soap factories mentioned below have under implementation schemes for the production of glycerine from the spent lye. These are: —

Expansion schemes for Glycerine

	Annual capacity
(1) Vegetable Soap Works, Calicut	250 tons
(2) Bharat Starch and Chemical Ltd., Abdullapur	225 „

(b) *Recommendation.*—Considerable improvement in the technique of production is possible during the period of the Plan. In the manufacture of soap, glycerine, a valuable by-product, can be recovered from the lye left over after separation of soap. In the factories employing the cold process, the lye is not separated but in factories using the boiled process, both small and large scale, it is generally separated from soap. The recovery of glycerine from the lye is not, however, carried out except in the larger units which have put up expensive plants for the purpose. The present capacity for recovery of glycerine is 3,150 tons per annum while production was 1,870 tons and 2,340 tons in 1950 and 1951 respectively. With a view to bringing down the cost of production of soap and improving its quality and also recovering a valuable raw material required by other industries for essential purposes, it is necessary to encourage the development of the glycerine industry by enabling the larger factories to put up recovery plants. In the case of the smaller units situated not far from one another, it might be possible to develop the recovery of glycerine on a cooperative basis by handling the lye in a central plant. At least, one additional plant with an annual capacity of about 300 tons should be brought into existence during the period of the Plan.

The table below summarises the programme of development of soap industry during the period of the Plan: —

	Unit	1950-51	1955-56
Annual rated capacity	Tons	265,200	280,470
Actual production	„	105,918	200,000
Exports	„	977	10,000

27. TANNING AND FOOTWEAR

The leather and leather goods industries play an important part in the national economy by providing employment to many workers and by earning valuable foreign exchange through the export of tanned hides and skins. These industries have been the principal subsidiary industries in the country's economy, and though large-scale factories have come into existence in the important cities during the last 80 or 90 years, the bulk of production is still carried on in small towns and villages. The leather and leather goods industries are classified as under:—

(*a*) Tanning of hides and skins.

(*b*) Manufacture of footwear.

(*c*) Manufacture of travel goods, etc.

(*d*) Manufacture of belting and other industrial leathers such as pickers, picking bands and roller skins.

This plan deals with the tanning and footwear industries only.

A. Tanning Industry

I. Brief Survey of the Industry

The tanning industry comprises four sections, *viz.*, organised tanneries producing finished vegetable tanned buffalo leather and chrome tanned upper leather; tanneries producing vegetable tanned leather known to the trade as E. I. kips and E. I. tanned skins; small-scale chrome tanneries producing chrome tanned upper leather; village tanneries producing vegetable tanned cow and buffalo leather and vegetable tanned leather from goat and sheep skins.

(a) *Location, rated capacity and production.*—In 1950, there were 26 large organised tanneries working with machines and producing vegetable tanned buffalo leather, and sixteen of these also produced chrome tanned upper leather. Their annual rated capacity was 3·184 million hides expressed in terms of cow hides (1 buffalo hide = 2 cow hides) for vegetable tanning and 1·976 million hides for chrome tanning. The main items of production were sole leather, harness leather, mechanical leather suitable for making pump cups, hydraulic appliances, washers, etc., leather suitable for travel goods, chrome upper leather including glazed kid leather, patent leather, suede and fancy leather.

The second section of the industry consists of about 500 tanneries producing vegetable tanned leather known to the trade as East India Kips (E. I. kips) and East India tanned skins (E. I. tanned skins). These tanneries are mainly concentrated in South India and have an annual productive capacity of about 10·0 million tanned hides and 20·0 to 21·0 million tanned skins. The leather produced by these tanneries is only semi-finished and a considerable part of the production is exported to the United Kingdom where it is further processed as required by the footwear manufacturers.

The third section of tanneries is constituted by about 250 small-scale chrome tanneries, mainly located in the Calcutta area and worked by the Chinese community there. Their production, it is stated, went up to 3·0 million tanned hides during the war mainly owing to increased civilian demands caused by the diversion of the output of the organised

tanneries for meeting defence requirements. Owing to the somewhat poor quality of the raw hides used by these tanners, the types of upper leather produced are generally not equal in quality to those of the large-scale tanneries.

Lastly, the village tanneries, though small and highly dispersed throughout the country, account for nearly 8·0 to 9·0 million raw hides and 3·0 to 4·0 million raw goat and sheep skins per annum.

The following statement summarises the position of the tanning industry at the commencement of the period of the Plan:—

Type of producer	Annual rated capacity for tanning in millions of pieces			
	Hides		Skins	
	Vegetable tanned	Chrome tanned	Vegetable tanned	Chrome tanned
(i) Large-scale tanneries (26)	3·184*	1·976	*N.A.*	*N.A.*
(ii) Tanneries producing E. I. kips and E. I. skins	10·000	..	20·000 to 21·000	..
(iii) Small-scale tanneries	..	3·000	..	..
(iv) Village tanneries	8·000 to 9·000	..	3·000 to 4·000	..

The production of tanneries in 1950-51 was estimated at 19·563 million pieces of which the organised factories in existence accounted for 585,000 pieces of chrome tanned hides and 776,000 pieces of vegetable tanned hides, the latter almost entirely consisting of buffalo tanned hides. There has been an increase in production in 1951-52 to the extent of 276,000 pieces in the case of chrome tanned hides and 100,000 pieces in the case of vegetable tanned hides in the large-scale organised tanneries. Nevertheless, there is still a considerable lag between capacity and production.

(b) *Capital and labour.*—Figures of capital and labour in the entire tanning industry are not available. According to the Census of Manufactures, 1950, the total fixed investment in 81 factories giving employment to 8,330 workers in 1950 was Rs. 85·0 lakhs. The working capital of these factories came to Rs. 261 lakhs in the same year.

(c) *Raw materials.*—The principal raw materials of the tanning industry are hides and skins. The partition of India has resulted only in a small reduction in the number of tanneries whereas important centres of supply of hides have now become part of Pakistan territory. This has adversely affected the supply of hides to the indigenous tanning industry. Tanning materials rank next in importance. The requirements of tanning materials are met from indigenous sources with the exception of wattle bark extract which is one of the most important of these materials and has at the present time to be imported in considerable quantities. Other important raw materials consumed by the tanning industry are: chemicals like lime, sodium sulphide, boric acid, artificial bates, sulphuric acid, sodium thiosulphate and bichromate of soda; tallow and fish and vegetable oils; coal-tar dyes

*Expressed in terms of cow hides (2 cow hides=1 buffalo hide). Mostly buffalo hides are utilised for vegetable tanning in this sector.

N.A.—Not available.

and water and nitrocellulose pigment finishes. The requirements of these materials at the commencement of the Plan period were estimated as under:—

Raw hides—20·0 million pieces; raw skins—25·0 million pieces; lime—25,000 to 30,000 tons; wattle bark and wattle bark extract—30,000 tons (imported); other barks—300,000 tons; myrabolans—25,000 to 30,000 tons; sodium sulphide—700 tons; boric acid—1,000 tons; sulphuric acid—1,500 tons; sodium bichromate—1,200 tons; sodium thiosulphate—300 tons; fish and vegetable oils—4,000 tons; coal-tar dyes—125 tons; artificial bates—60 tons; water and nitrocellulose pigment finishes—150 tons; tallow—1,000 tons.

(d) *Imports and exports.*—Whereas imports of manufactured leather are relatively small, exports play an important part in the foreign trade as shown below:—

	Hides, tanned or dressed, including calf skins	Skins, tanned or dressed	Leather, unwrought
	(Value in lakhs of Rupees)		
Exports—			
1948-49	496·4	720·4	39·4
1949-50	853·3	1,173·0	58·5
1950-51	1,212·2	1,324·8	38·0
1951-52	1,361·3	1,131·7	39·2
Imports—			
1948-49	0·02	1·07	4·3
1949-50	0·01	0·49	7·9
1950-51	0·09	1·7	4·5
1951-52	0·02	0·2	6·6

(e) *Estimated consumption and requirements.*—The principal outlets for leather in the country are the footwear industry and the manufacture of travel goods, fancy goods and industrial products like belting, pickers, picking bands and roller skins. The largest consumption, however, occurs in the footwear industry. Tanned leather is also required in considerable quantity for exports as shown by the data on exports given above.

The future domestic demand for tanned hides and skins by the footwear industry is estimated to increase in the final year of the Plan period by about 800,000 pieces of the former and 300,000 pieces of the latter for the production of an additional 6 million pairs of footwear.

II. Problems of the Industry

The most important problem of the tanning industry relates to availability of the principal raw materials, *viz.*, hides and skins and wattle bark. In the post-partition period, the tanning industry has been suffering from continuous shortage of hides. Though the position in regard to availability of goat and sheep skins is in general more reassuring, the tanning industry has still to import certain superior quality skins required for glazed kid manufacture. For stepping up the production of tanned hides in the country additional supplies of hides have to be arranged from Pakistan in the absence of suitable measures for augmenting the domestic supplies. Now that it has been decided that unproductive cattle should be cared for in *gosadans* and protected from slaughter, it is not possible to visualise any large-scale increase in the domestic supplies of hides. The recent bilateral trade agreement between India and Pakistan provides for import, between August 1952 and 30th June 1953, of 200,000 pieces of raw buffalo hides, 1·0 million pieces of cow hides,

100,000 pieces of sheep skins and 100,000 pieces of goat skins. Similar arrangements have to be made in future in bilateral trade agreements with neighbouring countries to ensure adequate supplies of raw material.

As regards wattle bark, which is an important tanning material consumed in large quantities in the country, the tanneries will have to depend on imports from East Africa and Kenya until such time as its production is developed indigenously. The Government of Madras are reported to be taking steps to bring about 21,000 acres of land under wattle plantation. Nursery and field tests are being carried out in the States of Uttar Pradesh, Punjab, West Bengal, Assam and Bombay. In view of the importance of wattle bark as an industrial raw material the State Government should pursue their schemes on a priority basis.

III. Programme of Development

The programme suggested below takes into account the shortage of raw materials which set a limit to planning future development on any really big scale. At the same time it seeks to meet the expanding demand for tanned leather within the country.

Programme during the period of the Plan.—As already stated there is at the present time a substantial gap between the capacity and production of the large organised tanneries as shown below:—

	1950-51	
	Rated capacity (million pieces)	Production (million pieces)
Vegetable tanned hides (in terms of cow hides)	3·184	1·543
Chrome tanned hides	1·976	0·585

High priority should, therefore, be given to a fuller utilisation of the existing capacity of these tanneries. On the basis of utilising 90 per cent. of the capacity, these tanneries can achieve an additional production of 1·3 million vegetable tanned hides in terms of cow hides and 1·2 million chrome tanned hides. With overheads distributed over a larger output, the price of leather produced at these tanneries should come down, other things being equal. This would be of considerable advantage to the industries depending on leather like footwear, belting, etc. As the operation of existing tanneries at a higher level of production would make available additional supplies of leather without further capital investment, this should be made the programme for the tanning industry during the period of the Plan. Long-range developments in this sector should encourage the establishment of new units, whenever necessary, on the basis of industrial co-operatives.

Recommendations.—(i) As long as the shortage of hides for the tanning industry continues, the Central Government should maintain the ban on the export of raw hides.

(ii) The hides and skins marketed in the country are capable of considerable improvement in quality by better control over the methods of flaying, curing and preservation. The quality of finished leather can be improved by improvement of techniques. The Government should make available to the small producers the necessary knowledge through demonstration parties and other measures. These improvements in quality will go a long way towards establishing exports.

(iii) While there may not be a reasonable case for the establishment of tanneries so long as the available capacity is not utilised to a fuller extent, the Central Government

should encourage new units in the event of expanding exports justifying such a step. The expansion of the manufacture of glazed kid leather in the country has also to be examined from this angle.

B. Footwear Industry

I. Brief Survey of the Industry

The principal use of leather in India as in every other country is for the production of footwear which is widely dispersed. The scale of operations shows great variations in volumes of output. The production of footwear covers Indian and Western types which are machine-made as well as hand-made. According to the Monthly Statistics of Selected Industries of India, nine of the large-scale factories in existence had an annual rated capacity of 4·7 million pairs of Western type footwear at the beginning of 1951. Messrs. Bata Shoe Co. and Messrs. Cooper Allen & Co. account for about 75 per cent. of this total capacity. Small-scale factories and cottage units producing hand-made footwear are spread throughout the country but important centres are: Kanpur, Agra, Calcutta and Bombay, and are estimated to produce annually about 13 million pairs of western type leather footwear and nearly 70 million pairs of the indigenous kind.

The output of the large-scale factories since 1949 was as under :—

	Western type footwear (million pairs)		Indian footwear (million pairs)	
	Capacity	Production	Capacity	Production
1949-50	4·724	2·749	*	2·166
1950-51	4·724	3·182	*	2·013
1951-52	4·724	3·674	*	2·038

(b) *Capital and labour.*—Data on capital and labour in the footwear industry is not available.

(c) *Raw materials.*—On the basis of the level of footwear production estimated at 85·0 million pairs in 1950-51, the requirements of raw materials are approximately as shown under: —

(i) Leather	10·25 million tanned hides; and 4·0 million tanned skins.
(ii) Thread	4·51 million reels for upper and 300 tons for others.
(iii) Eyelets	240 million pieces.
(iv) Other items of grindery	1,100 tons.
(v) Abrasives	7·5 million yards.

No. (i) is completely indigenous and No. (iii) is completely imported whereas the other items are obtained from both the sources.

(d) *Imports and exports.*—In the past few years imports of footwear were drastically restricted to conserve foreign exchange so that the requirements of the domestic market were being met by the indigenous industry. The figures of foreign trade since 1948 have been as under :—

	Imports		Exports	
	Number	Value in lakhs of Rs.	Number	Value in lakhs of Rs.
1948-49	16,153	1·52	778,145	55·3
1949-50	24,140	3·65	380,933	22·3
1950-51	1,418	0·23	539,228	26·9
1951-52	Negligible	0·10	1,417,506	113·2

*Being hand-made, the capacity fluctuates with demand.

Exports of footwear are visualised at between 0·5 and 1·0 million during the period of the Plan.

(e) *Consumption and estimated requirements.*—The off-take of footwear within the country was estimated at about 85·0 million in 1950. At the same level of demand, but allowing for an increased population, the domestic requirements by 1955-56 would be higher by about 5·0 millions. Adding the requirements for exports, the additional demand in 1955-56 is estimated at 5·5 to 6·0 million footwear.

II. Problems of the Industry

The main difficulty experienced by the footwear industry is the shortage of leather and other materials like eyelets for which it is dependent on imports. There is also the problem of competition between large-scale units and the small producers in this widely scattered industry. The difficulties of small units are really connected with the high prices they have to pay for raw materials from middlemen. Bulk purchase of raw materials by agencies like industrial co-operatives on behalf of these producers would ensure supplies regularly and at more reasonable prices and, therefore, the formation of such co-operatives should be encouraged by State Governments. Imports of other items like eyelets, etc., which are not produced in the country should be placed on O. G. L.

III. Programme of Development

(a) *Development Plan.*—On the basis of future requirements estimated under I (e) above, the production of footwear will have to be stepped up from 85·0 millions to 90·5 to 91·0 millions. This should be achieved by fuller utilisation of the existing capacity of the large-scale factories and through the establishment of 100 new small-scale units each with an outturn of 100 pairs per day principally of Indian type footwear. The contribution of the large-scale factories to the additional output is visualised at 2·5 to 3·0 million pairs of both western and Indian types footwear. It is estimated that each new unit will require a capital outlay of Rs. 60,000 so that the total financial requirements would come to about Rs. 60 lakhs.

(b) *Recommendations.*—In view of the fact that the footwear industry can be organised on a labour intensive basis and can thus ensure increasing employment to small entrepreneurs and independent artisans, permission should not be normally given for the establishment of new large-scale factories or for substantial expansion of existing units engaged in footwear manufacture. New small-scale units should be encouraged near towns rather than in large cities and they should concentrate more on the manufacture of Indian footwear. The purchase of raw materials and marketing of footwear should be undertaken to an increasing extent by co-operatives of small-scale producers whose establishment should be encouraged by State Governments.

The following table summarises the programme of development of the footwear industry during the period of the Plan:—

	1950-51	1955-56
Production (million pairs)	85·0	91·0
Exports (million pairs)	0·539	0·5 to 1·0

28. PAPER AND PAPER-BOARD

Although the earliest attempts to manufacture paper in India can be traced back to 1870, there were up till 1913 only 5 paper mills in the country. The growth of the paper industry during the inter-war period was rather slow. Between the years 1925 and 1937, the number of mills increased from 6 to 9, and the production expanded from about 27,000 to 48,500 tons. A significant development during this period was the manufacture of pulp from bamboo, which enabled the industry to do away with imports of foreign wood pulp to a considerable extent. During the recent world war, the number of mills increased to 15 and the annual production reached the peak figure of 104,000 tons, despite the fact that the industry's requirements of the principal raw materials had to be met largely from indigenous sources. The paper industry in India developed under the shelter of protection, which was granted in 1925 and renewed periodically till it was withdrawn in 1947.

At present, the paper and board industry comprises three sectors, namely:—

(i) Paper and paper-board,

(ii) Newsprint, and

(iii) Straw-board and other boards (excluding wall boards).

While the first and the last sectors of the industry have developed appreciably, the manufacture of newsprint has not yet been started in the country, though certain measures have been taken towards this end.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production*—(i) *Paper and paper-board.*—With the coming into production of two new units (*i.e.*, Messrs. Triveni Tissues Ltd. and Pudukottah Paper Mills Ltd.) towards the end of 1950, the total number of factories increased from 15 in 1948-49 to 17 by the end of 1950. This number does not take into account Travancore Rayons Ltd., which is equipped to produce about 400 tons of transparent paper per annum. As a result of the new factories and the expansions carried out by three of the existing units, the total rated capacity had increased to as much as 136,600 tons by February 1951, as compared with 110,000 tons during 1948-49 and 1949-50. The state-wise distribution of the existing paper and paper-board industry is shown below:—

State-wise distribution of the paper and paper-board industry in February, 1951

States	Number of units	Annual rated Capacity (tons) (Based on 300 working days)
West Bengal	4	58,500
Bihar	1	11,000
Orissa	1	31,500
Uttar Pradesh	2	6,400
Punjab & PEPSU	1	8,500
Bombay	3	5,100
Madras	2	2,600
Hyderabad	1	5,000
Mysore	1	4,000
Travancore-Cochin	1	4,000
TOTAL	17	136,600

The paper and paper-board industry is one of the few industries in which there has been no significant gap between rated capacity and actual production. During the years 1948-49 and 1949-50, the actual production was about 98,000 tons and 104,000 tons amounting to about 89 per cent. and 94 per cent. respectively of the rated capacity. During 1950-51, however, the actual production was only about 83 per cent. of the rated capacity since most of the increase in the capacity took place only towards the beginning of 1951.

Besides producing writing, printing, wrapping and other varieties of paper, some of the units are manufacturing different types of paper-board. The production of the different categories of paper and paper-board during 1950-51 and 1951-52 was as follows:—

Production of different varieties of paper and paper-board

Variety	1950-51 (' 000 tons)	1951-52 (' 000 tons)
(i) Printing and writing	72·149	82·977
(ii) Wrapping—		
(*a*) Kraft	10·743	17·202
(*b*) Brown	6·768	8·184
(iii) Special varieties	3·262	2·483
(iv) Boards—		
(*a*) Duplex and Triplex	9·937	12·015
(*b*) Pulp Boards	7·453	6·383
(*c*) Other Boards	3·431	5·628
TOTAL	113·743	134·872

The paper and paper-board industry falls in the private sector, except for State-aid and participation in three paper mills, namely, the Mysore Paper Mills, the Sirpur Paper Mills and the Punalur Paper Mills.

(ii) *Straw-boards and other fibre boards.*—There are now (1952) 20 factories engaged in the manufacture of a wide range of straw and other boards with an annual rated capacity of about 54,500 tons. Two of these mills (Messrs. Straw Boards, Ratlam and Messrs. National Straw Products, Digendranagar) have only recently been taken on the active list of the Development Wing of the Ministry of Commerce and Industry.

The straw and other board industry has been working at less than 50 per cent. of the annual rated capacity; the actual production amounted to about 19,000 tons during 1948-49, 22,500 tons during 1949-50, and did not show any appreciable improvement during 1950-51. Production in 1951-52 came to 25,400 tons. The short-fall in production is ascribed mainly to the scarcity of raw materials. However, the major problem of this section of the industry is the extremely small size of the units in existence; only three or four of the existing units are large enough to be considered economic.

(b) *Capital and labour.*—The block capital, inclusive of the working capital, invested in the paper and paper-board industry was estimated at about Rs. 21·8 crores during 1950-51, including some of the money already spent on the new projects which are still being completed. The total number of persons employed in the paper and board industry, consisting of 37 factories, including 5 small and unorganised units, was estimated at about 22,000 in 1950.

(c) *Raw materials.*—The more important raw materials required by the paper industry are bamboo and *sabai* grass. The board industry uses straw, grass and bagasse as the

principal raw materials. The paper industry is also an important customer of the chemical industry; the principal chemicals required are: lime, caustic soda, soda ash, chlorine, sulphur, sodium sulphate, ferric alumina and aluminium sulphate, rosin and clay. While most of the factories obtain their requirements of such chemicals from the manufacturers, there are some paper manufacturers who are also equipped to produce their own requirements of a few chemicals, especially caustic soda and chlorine. The annual output of such manufacturers is of the order of 4,000 to 4,500 tons of caustic soda and an equivalent quantity of chlorine. The industry's requirements of sulphur are met entirely by imports. Substantial quantities of soda ash and caustic soda are also obtained from abroad.

With regard to fuel, the demand for coal is generally placed at about 3·5 tons per ton of finished paper. Coal consumption in some of the paper mills utilising hydel power is comparatively lower. According to the manufacturers, however, the average coal consumption of all the factories is higher and is estimated to have been of the order of 4·1 tons per ton of paper during recent years.

(d) *Imports and exports.*—With a steady increase in the domestic production of paper and paper-board during the last three years, there has been a steady decline in the imports of paper. On the other hand, the imports of newsprint and of different kinds of board have fluctuated. India has also been importing substantial quantities of paper-making materials during the last few years. The following table shows the quantity and value of imports of paper, newsprint, boards and also paper-making materials during the last three years:—

Imports of different types of paper, newsprint and boards

(Quantity (Q) in tons '000; Value (V) Rs. lakhs)

	1949-50		1950-51		1951-52	
	Q.	V.	Q.	V.	Q.	V.
I.—*Paper*—						
1. Packing and wrapping	7	89	7	89	11	253
2. Printing paper	10	147	5	70	7	147
3. Newsprint	45	270	75	537	50	570
4. Writing paper and envelopes	10	138	4	58	5	126
5. Other kinds	28	153	16	194	13	220
TOTAL	100	797	107	948	86	1,316
II.—*Boards*—						
6. Straw-boards	6	17	0·1	1	0·4	7
7. Other kinds	7	75	3·2	41	4·0	74
TOTAL	13	92	3·3	42	4·4	81
GRAND TOTAL	113	889	110·3	990	90·4	1,397
III.—*Paper-making materials*—						
1. Wood pulp	13·6	63	6·0	40	5·0	103
2. Rags and other materials	0·6	2	0·2	0·42	0·5	1·34

Exports of paper from India have not been appreciable in the past. The total sea-borne exports amounted to about 840 tons (valued at Rs. 12·9 lakhs) during 1948-49 and 407 tons (Rs. 6·1 lakhs) during 1949-50. During 1950-51 the exports went up to as much as 1,668 tons, valued at Rs. 24·3 lakhs but in 1951-52 fell to 1,204 tons valued at Rs. 28 lakhs.

The exports of straw and other kinds of boards have been still smaller. The total exports during 1948-49, 1949-50, and 1950-51 amounted to about 57 tons, 28 tons, 83 tons respectively. In 1951-52, however, they went up to 2,146 tons.

(e) *Estimated consumption and requirements*—(1) *Paper and paper-board.*—The total quantity of paper and paper-board (excluding newsprint) available for consumption was about 158,000 tons during 1949-50 and 143,000 tons during 1950-51, compared with about 120,000 tons estimated to have been consumed in 1938-39 in the area now comprising the Indian Union. High prices have been largely responsible for restricting the demand for paper during the last several years. However, with improvement in economic conditions and the spread of literacy, the demand for paper should increase still further.

The Panel on Paper, Pulp, Board and Chemical Cotton Industries (1947) estimated the consumption of paper, excluding newsprint but including old newspapers used as wrapping paper, at 220,000 tons in 1951 and 320,000 tons in 1956. The aggregate demand, exclusive of newsprint and old newspapers, has been recently estimated at 175,000 tons per annum during 1951-52 and 1952-53, and at 200,000 tons by 1955-56. These revised estimates take into account the present level of prices, the effects of partition and certain activities connected with literacy campaigns which would stimulate the demand during the period of the Plan.

(2) *Newsprint.*—According to the Panel, the demand for newsprint was estimated at 60,000 tons in 1951 and was expected to increase to 100,000 tons by 1955-56. Revised estimates of consumption might be more reasonably placed at about 75,000 tons per annum during 1951-52, 80,000 tons during 1952-53 and 100,000 tons by 1955-56. Unfortunately, on account of the present international situation, there is an acute shortage of newsprint in all the producing countries of the world and the prospects of meeting the country's requirements from imports do not appear to be bright. So long as the domestic newsprint industry is not fully developed, it will be necessary to restrict the consumption of newsprint in accordance with the availability of supplies from foreign sources.

(3) *Straw-boards and other boards (excluding wall boards).*—The consumption of straw-boards and other boards was over 54,000 tons during 1949-50 and 46,000 tons during 1950-51, including on an average about 18,000 to 20,000 tons of paper-boards. The future requirements are estimated at 65,000 tons in 1952-53 and 95,000 tons by 1955-56, inclusive of about 25,000 tons of paper-board. The increased demand for boards is expected to arise from industries, such as the textile, footwear, and pharmaceutical industries, etc., requiring boards for packing purposes.

II. Problems of the Industry

The main problem of the industry is the shortage of raw materials, which was accentuated by the partition of the country, as the factories in West Bengal were deprived of their supplies of bamboo previously obtained from East Bengal. In view of the projects already under implementation and other expansions (detailed below) which are contemplated the demand for the various raw materials is expected to expand considerably. In this connection, it may be stated that a number of units in Bengal and Bihar will have to depend on supplies of bamboo from Orissa. It is, therefore, essential to organise adequate supplies of this raw material to the existing factories in the first instance, and later on to the new projected units. Efficient collection of waste paper and rags requires also to be organised.

It is reported that raw materials, such as bamboo and *sabai* grass, are subject to widely varying terms of supply in the different States and the question of a uniform and long-

range policy for helping the industry and organising the supplies of such raw materials requires early consideration by the Government of India and the States. Some of the measures which might help to solve the problem of raw material supplies are:—

(i) Reservation of specific forest areas for the paper industry and grant of long-term leases for working such areas;

(ii) A rational method of price fixation on an all-India basis to enable the industry to obtain regular supplies of bamboo and grass at reasonable prices. To safeguard the interests of the State Governments, arrangements might be made for the supply of such raw materials to the industry on the basis of a basic price, and a premium closely related to the selling price of the manufactured product or the profit margin;

(iii) Development of roads in forest areas for facilitating transport;

(iv) Careful regulation, or even total banning, of the export of cloth cuttings, hosiery cuttings, hessian and jute cuttings and waste paper.

III. Programme of Development

(a) *Existing programme*—(i) *Paper and paper-board and newsprint.*—The following table indicates the plans for the expansion of old units and the construction of new units envisaged for the paper and board industry. Some of the schemes of expansion are already being implemented.

Development plans envisaged for the paper and paper-board industry

Firm	Type of development	Annual rated capacity: 1950-51	Annual rated capacity: After materialisation of development plan	Year when the development is expected to be completed
		(In '000 tons)		
1. Rohtas Industries Ltd.	Expansion	11·0	13·0 15·0 26·4	1951-52 1952-53 1953-54
2. Ballarpur Paper and Straw-board Mills Ltd.	New Unit	..	8·0	1952
3. India Paper Pulp Co.	Modernisation	6·0	6·6	1952-53
4. Punalur Paper Mills	Expansion	4·0	6·0	1953
*5. NEPA Mills Ltd.	New Unit	..	30·0 (Newsprint)	1953
6. Cauvery Paper Mills	New Unit	..	3·0	1952
7. Orient Paper Mills	Expansion	31·5†	50·0	1955-56
8. Shri Gopal Paper Mills	Expansion	8·5	18·0	1955-56
9. Star Paper Mills	Expansion	4·5	6·5	1953-54
*10. Sirpur Paper Mills	Expansion and New Unit.	5·0	13·0	1952-53
11. Mysore Paper Mills	Expansion	4·0	8·0	1954
12. Bengal Paper Mills	Modernisation	11·0	14·0	1952

As a result of the implementation of the above programme of development, estimated to cost about Rs. 8·0 crores, including investment on block and part of the working capital, the rated capacity of the industry would expand to 211,000 tons of paper and paper-board and 30,000 tons of newsprint by 1955-56. The actual production is, however, expected to be of the order of 200,000 tons of paper and paper-board, and 27,000 tons of newsprint by 1955-56.

* In the public sector.
† Capacity as in February, 1951.

(2) *Straw-boards and other boards.*—Expansion plans projected by Messrs. Straw Products Ltd., Bhopal, would increase the present capacity by about 4,000 tons and attain 58,500 tons per annum by 1955-56. Taking the actual production of the industry at 90 per cent. utilisation of the rated capacity, the production of boards is expected to go up to 52,000 tons by 1955-56. In addition, about 25,000 tons of paper-boards would also be available for consumption. Thus, total availability of boards is visualised at about 77,600 tons by 1955-56, as against an anticipated demand of about 95,000 tons.

(b) *Recommendations.*—The following recommendations are made for the development of the industry :—

(i) The production of 200,000 tons of paper and paper-board by 1955-56 is considered to be adequate to meet the anticipated domestic requirements. It should not, therefore, be necessary, if the schemes materialise in accordance with the programme, to establish any further new units during the period of the Plan. Further development, if any, should accord priority to expansion of some of the existing uneconomic units to the minimum economic size of 8,000 tons of paper per annum.

(ii) The newsprint plant of the NEPA Mills is expected to go into production during 1953 and to meet domestic requirements to the extent of 27,000 tons, from 1954 onwards. In view of the large gap between the estimated requirements and the supplies anticipated from the NEPA Factory, and also the present acute shortage of newsprint throughout the world, there is ample scope as well as justification for expansion of the newsprint industry in the country. While arrangements have been made to utilise *salai* wood in the newsprint factory at Madhya Pradesh, sufficient quantities of soft wood, such as spruce and pine, commonly used for the manufacture of newsprint in other countries, are also available in the Himalayan regions. The difficulty of utilising them so far for developing the newsprint industry has been want of transport but, according to the Ministry of Food and Agriculture, the Forest Department of the Government of India has worked out suitable methods for rendering such species of wood fit for easy transport to suitable sites. In view of the fact that such wood is also best suited for producing chemical pulp for the rayon industry, which should also expand considerably during the next few years, it might be desirable to establish a plant of economic size (100 tons of pulp per day) which would produce both newsprint and chemical pulp for the rayon and staple fibre industry. Details of such a project and necessary recommendations have been made under the development plan for the rayon industry.

(iii) Recent press and scientific reports indicate that it is possible to manufacture pulp suitable for newsprint from bamboo and bagasse. Such developments might enable newsprint factories to be established in new areas where bamboo or bagasse resources are readily available. Research and pilot plant investigations should, therefore, be undertaken to examine the possibilities of utilising bagasse and bamboo to produce pulp suitable for newsprint manufacture, either directly or in admixture with other pulps. As a long-term programme, efforts should be made to determine timber species which are suitable for the manufacture of newsprint and to plant them in the forests at lower altitudes.

(iv) There is likely to be a gap of about 17,400 tons between production and estimated requirements of straw-board and other fibre boards even after the implementation of the expansion programmes envisaged in this sector of the industry. It should be possible to bridge this gap if some of the sugar factories instead of consuming bagasse as fuel utilise other fuels such as wood or charcoal or coal, depending on the situation of the factory, and release bagasse for the manufacture of boards. In this connection, a careful

examination of the economics of a change-over from bagasse to other fuels is necessary, particularly in the sugar factories situated either near the coalfields in Bihar or near the forest areas in Northern U. P. and Punjab. These developments should be worked out by the sugar industry in collaboration with the paper and board manufacturers, wherever deemed necessary.

(v) The development of the paper industry during the period of the Plan would involve an increasing utilisation of the bamboo resources in all areas, except in the north where the expansion project of Shree Gopal Paper Mills would have to depend for its success on the availability of *sabai* grass, rags and waste paper and probably bagasse as well. Measures should, therefore, be concerted for plantation of bamboo, to make good the depletion of this material and for development of *sabai* grass in Uttar Pradesh and Punjab. At the same time, the collection of waste paper, rags, etc., should be more efficiently organised so that these subsidiary raw materials would also become available to an increasing extent.

(vi) The State Governments, under the guidance of the Central Board of Forestry, should evolve a uniform policy for the leasing of bamboo and other timber forests and grasslands with the object of aiding the development of the paper industry.

(vii) As *semal* wood is a basic raw material for the match industry, its resources require to be husbanded carefully and the use of this wood by the paper industry should be discouraged.

(viii) Electric power is being utilised at present by the paper mills in the States of Mysore, Travancore-Cochin and Bombay only. The possibility of extending the use of electric power in other areas should be explored.

(ix) The paper industry should adjust its production programme so as to meet the requirements of the principal industrial consumers such as the match industry, cigarette industry, packing industry, abrasives industry, etc., and should modernise the technique of production so as to realise the following objectives:—

(i) reduction in the price of paper by reducing the consumption of fuel and different raw materials; and

(ii) improvement in the quality of the different varieties of paper, particularly wrapping paper and kraft paper.

The following table summarises the development programme of the industry during the period of the Plan:—

	1950-51			1955-56		
	Number of units	Annual rated capacity ('000 tons)	Actual production ('000 tons)	Number of units	Annual rated capacity ('000 tons)	Actual production ('000 tons)
Paper and paper board.*	17	136·6	114	19	211	200
Newsprint . .	..	..	..	1	30	27
Strawboard and other fibre-boards (*ex.* wall boards).	18	48·5	22	20†	58·5	52·6

*Account has not been taken of the newsprint and chemical pulp plants because, although the expenditure might be incurred, it might not be ready for production by 1956.

†Includes the two board mills taken on the active list of the Development Wing of the Ministry of Commerce and Industry in 1952.

29. CEMENT

Cement is now one of the most important and basic building materials and in admixture with sand and aggregate, in the form of concrete, has also established itself as one of the most suitable materials for construction where strength, durability and water-resistance are all required together. In the near future, the demand for cement in India is expected to expand considerably because of the construction of the multi-purpose projects as also of new buildings and roads. Any large increase in the consumption and production of cement in India is, however, linked up with an overall improvement in the standards of living.

The cement industry is one of the well-established industries of the country. It grew up in the inter-war period and has attained its present status without any fiscal protection.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—By March 1952, there were 23 cement factories (including the Sevalia factory, Bombay State, which came into production in April 1951, and the Rajganjpur factory which started production in early 1952) with an annual rated capacity of about 3·88 million tons, distributed over different parts of the country. The rated capacity of the units has been estimated on the basis of 330 working days per annum. In addition to the two combines—the Associated Cement Companies owning 12 factories (capacity, 2·3 million tons) and the Dalmia Group owning 4 factories (capacity about 825,000 tons)—there are 6 independent manufacturers with a total capacity of about 670,000 tons and a factory (capacity of about 86,000 tons) owned and operated by the Government of Mysore. The regional distribution of the industry as on 31st March 1951 is shown in a table on page 174.

Since 1915, the rated capacity of the cement industry has been more than doubling itself in every decade. During the last few years, the capacity has increased fairly rapidly. From 2·29 million tons in 1948-49, it went up to 2·89 million tons in 1949-50 and to about 3·28 million tons in 1950-51. The actual production of cement, however, has been below capacity,—1·69 million tons during 1948-49, 2·23 million tons during 1949-50 and 2·69 million tons during 1950-51. The actual production during 1951-52 was 3·29 million tons, while the rated capacity had risen to 3·88 million tons.

(b) *Capital and labour.*—A sum of about Rs. 29 crores had been invested in the cement industry up to 1950-51. Of the total, the investment of the Associated Cement Companies (A. C. C.) amounted to nearly Rs. 15·5 crores, of the Dalmia Group Rs. 7·0 crores, and of all the other units, including that of the Mysore Government, Rs. 6·5 crores.

The total number of persons employed in the Industry during 1950-51 was estimated at about 33,000 (27,000 in the A. C. C., 2,000 in the Dalmia Group, and 4,000 in other units).

(c) *Raw materials.*—The principal raw materials required for the manufacture of cement and their approximate consumption per ton of cement are:—

Limestone and clay	1·6 tons
Gypsum	0·035 ,,

Although coal is the principal fuel generally used in the manufacture of cement, fuel oil is also used. The consumption of coal varies between 0·2 to 0·5 tons per ton of cement depending on a number of factors.

(d) *Imports and exports.*—Imports of cement before the outbreak of the war were small and generally of special quality. During the post-war period they increased to some extent notwithstanding the increased domestic production. In 1948-49, for instance, imports by sea amounted to nearly 150,000 tons and in 1949-50 to about 300,000 tons. In addition to the imports by sea, the total imports into India by the land routes from Pakistan amounted to about 25,000 tons in 1948-49 and about 100,000 tons in 1949-50. With the increase in production since 1950, imports were restricted to quantities included in trade agreements as well as to those in respect of which commitments had been entered into prior to 1950. The imports were only about 17,000 tons in 1950-51 and the quantity imported in 1951-52 was negligible.

Exports of cement took place during the war years but since the end of the war, in view of the large domestic demand, there have been no exports except in very limited quantities to Pakistan on the basis of trade agreements, and to countries of the Middle East, Ceylon and East Africa. It is, however, possible that with the large increase in capacity under implementation, the industry would be in a position to export 200,000 to 300,000 tons per annum by 1955-56. The quantity available for export might be even higher if domestic demand does not keep pace with the increasing capacity coming into operation.

(e) *Estimated consumption and requirements.*—The annual consumption of cement was 600,000 to 700,000 tons during the years 1929 to 1934, when owing to the general economic depression there was little constructional activity. Gradually the demand increased and during the war years 1941-45, as Government expenditure on the construction of houses, roads, aerodromes and factory buildings went up, the consumption of cement also increased to 2·0 million tons per annum and during the post-war years, 1949-50 and 1950-51, it increased still further to about 2·6 million tons. The figures of the total cement supplied to different areas in India during 1951 and for the first half of 1952 amounted to 3·17 and 1·714 million tons respectively, indicating a continuation of the upward trend. The sharp increase during the recent years, when the war-demand had completely disappeared, may partly be ascribed to the impact of the pent-up civilian demand and to the expenditure on the housing of displaced persons. However, a view has been expressed that the consumption of about 2·6 million tons during the last few years represents only the present essential demand and there is still a considerable volume of non-essential demand to be taken into account to assess correctly the total future requirement of cement in the country.

The future demand for cement, exclusive of the quantity required for multi-purpose projects and roads, is estimated to increase to about 3·3 million tons by 1952-53 and 3·8 million tons by 1955-56. These estimates of the future demand have been worked out on the basis of the figures of demand received by the Ministry of Commerce and Industry in the last few periods from the various co-ordinating authorities after making allowance for the tendency on the part of consumers to pitch demands a little high in view of cement being in short supply. In addition, the requirements of cement for certain multi-purpose projects and the development of roads during the period of the Plan have been estimated at about 3·0 million tons and 600,000 tons, respectively. Including the annual average requirements of the multi-purpose projects (600,000 tons) and roads

(over 100,000 tons), the total demand for cement on the above basis would be about 4·0 million tons by 1952-53 and 4·5 million tons by 1955-56.

II. Problems of the Industry

The principal problems of the industry relate to the uneconomic character of some of the existing units in the industry, the high cost of production and distribution, and the price differential allowed by the Government in favour of new factories till April 1952. Rationalisation of marketing arrangements is also an unsolved problem. These are briefly explained below:—

(1) At present, eight of the existing units have an annual capacity of less than 100,000 tons each, which is considered uneconomic. Two of these units, however, are expected to raise their capacity to over 100,000 tons before the end of the next five years. The question of allowing the other uneconomic units to expand their capacity to an economic size may require consideration, particularly as demand increases and the necessity arises for installation of additional capacity. The question whether the minimum economic size should be taken to be 100,000 tons or 150,000 tons may have to be reviewed and decided in the light of further developments.

(2) The cost of production and distribution of cement in the country is still high. As cement is a basic material entering into the capital cost of industry, irrigation, housing, etc., and as the cement industry is already well established in the country, it is necessary to exert continuous pressure to bring down its cost. The following are some of the main difficulties faced by the industry:—

(*a*) Easily accessible supplies of limestone are being rapidly consumed and, in some cases, factories are obliged to transport limestone over long distances.

(*b*) The co-operation of the State Governments in the matter of giving to the industry long-term leases of limestone of suitable quality is not always forthcoming.

(*c*) The cost of transport is an important item both in the cost of production and distribution of cement. It should be possible to bring down the cost by careful location of factories consistent with the facilities for both manufacture and distribution.

(*d*) Packing charges form a substantial proportion of the cost of cement to the consumer, particularly because of the short supplies of raw jute and consequential high prices of jute bags. The position has eased considerably owing to increased availability of jute bags in the last few months.

(*e*) The industry for the manufacture of cement machinery has not yet been fully developed in the country, so that the cement industry has been obliged to depend largely on imported machinery and the present high cost of machinery for replacement and for new plants is creating difficulty.

(*f*) Wide fluctuations in the price of fuel oil have prevented its wider adoption by factories which are otherwise more favourably situated.

III. Programme of Development

(a) *Existing programme.*—According to an expansion programme drawn up by the Government in 1946, production of cement was to be stepped up to about 6·2 million tons within the next five years, but subsequently due to the partition of the country and the slackening in the tempo of development, the programme had to be modified. Under the revised expansion programme of the industry approved by the Government, the rated capacity will be increased from 3·28 million tons in 1950-51 to 4·22 million tons by 1952-53 and to 5·0 million tons by 1955-56 as the result of the implementation of the following projects:—

	Capacity in 1950-51 ('000 tons)	Capacity in 1952-53 ('000 tons)	Capacity in 1955-56 ('000 tons)
I.—*Expansion of existing units*—			
(*a*) Plants of Associated Cement Co. at—			
Shahabad	240	280	280
Lakheri	225	360	360
Bhupendra	200	300	300
Dwaraka	180	230	230
Porbander	42	42	102
(*b*) Plants of Dalmia Cement Co. at—			
Dadri	42·3	75·7	82·5
(*c*) Other Cement Factories—			
Shri Digvijay	115	115	230
Kalyanpur	41·3	41·3	80
Andhra	33	99	99
Mysore Government Factory, attached to Mysore Iron & Steel Works.	86	90	90
India Cements	115	115	165
II.—*Establishment of new units*—			
(*a*) Plant of Associated Cement Co. at—			
Sevalia	..	200	200
Sindri	..	..	200
(*b*) Plants of Dalmia Cement Co. at—			
Jaipur	..	165	165
Rajganjpur	..	165	165
(*c*) Other Cement Factories—			
Bagalkot Cement Co.	..	..	100
U. P. Government Factory at Pipri	..	..	200

The cement factory at Sindri would make use of calcium carbonate sludge obtained as a by-product from the operations of the Sindri Fertiliser Factory. One more factory

with an annual capacity of 100,000 tons per annum has been sanctioned to be set up at Rajpipla (Bombay), but it is understood that it is not likely to start production by 1956. Assuming actual production at 90 per cent. of the rated capacity, the quantity of cement available in 1955-56 would be about 4·5 million tons.

The above developments are mainly in the private sector, except the following:—

(*a*) The capacity of the cement factory belonging to the Government of Mysore has increased from 20,000 tons in 1949-50 to 86,000 tons at present and will reach 90,000 tons by 1955-56.

(*b*) A cement factory of a capacity of 200,000 tons per annum, under installation at Pipri by the U. P. Government, is to come into production during the second part of the period of the Plan.

The additional capital investment required for increasing the capacity from 3·28 million tons in 1950-51 to 5·0 million tons by 1955-56 is roughly estimated at about Rs. 17 crores. A part of the investment, however, has already been made.

The State-wise distribution of the cement industry during 1950-51 and towards the end of the period of the Plan is indicated below:—

State-wise distribution of the cement industry

State	1950-51		1955-56	
	Number of Units	Rated Capacity ('000 tons)	Number of Units	Rated Capacity ('000 tons)
Bihar	5*	921	6	1,160
Orissa	..	..	1*	165
U. P.	..	..	1	200
Madhya Pradesh	1	350	1	350
Madhya Bharat	1	60	1	60
Rajasthan	1	225	2	525
PEPSU	2	242	2	382
Saurashtra	3	337	3	562
Bombay	..	..	2	300
Madras	5	769	5	882
Mysore	1	86	1	90
Travancore-Cochin	1	50	1	50
Hyderabad	1	240	1	280
TOTAL	21	3,280	27	5,006

(b) *Recommendations.*—The following recommendations are made for the planned development of the industry:—

(i) Assuming the requirements to be 4·5 million tons by 1955-56, it would appear that the installed capacity of the cement industry by 1955-56 may be sufficient for meeting the demand in full. However, having regard to the possibilities of developing exports to neighbouring countries and the desirability of enabling the small units to expand to the size of economic units of 150,000 tons annual capacity so that production costs can be reduced, there may be a case for

*The factory went into production in early 1952.

further expansion of this industry, during the period of the Plan. Further, such a development has to be viewed from the angle of industrialising backward areas and making the best possible use of the railway capacity through avoidance of cross-movements and long distance haulage of cement and its raw materials. In this connection, mention must be made of the latest schemes of the Associated Cement Co. to expand their units at the following places which have been submitted to the Central Government for issue of a licence in accordance with the Industries (Development and Regulation) Act, 1951:—

Kistna Factory	From 90,000 to 190,000 tons
Bhupendra Factory	From 300,000 to 400,000 tons
Shahabad Factory	From 280,000 to 380,000 tons
Chaibassa Factory	From 200,000 to 300,000 tons

The expansion of the Chaibassa Factory is linked with the utilisation of granulated slag from the blast furnaces of the Tata Iron & Steel Co. at Jamshedpur. This is a development based on processes adopted in European countries to produce blast furnace cement (*ciment fondu*) which is widely used for marine constructions. Certain additional transport facilities between Jamshedpur and Chaibassa are necessary for this project.

The Central Government should come to an early decision on the question of further expansion of the cement industry during the period of the Plan over and above the capacity of over 5 million tons that would be achieved through the completion of projects falling under the 'existing programme'. It may not be necessary to permit more than 300,000 to 400,000 tons of additional capacity during the period of the Plan having regard to the limitations in the capacity for additional railway transport and other relevant factors like regional demand. It is understood that sanction has recently been given to the expansion projects of the A. C. C. relating to Kistna, Bhupendra and Shahabad factories mentioned above.

(ii) Encouragement should be given to the existing uneconomical units to expand to a minimum economic size.

(iii) The industry should undertake renovation of old machinery with a view to improving efficiency and bringing down costs.

(iv) The State Governments should help the industry by granting long-term leases to the different units for the exploitation of suitable qualities of limestone.

(v) Foreign markets should be explored and while entering into bilateral trade agreements, the surplus capacity of the cement industry should be taken into consideration.

The table below indicates the programme of development of the industry during the period of the Plan. This covers all the schemes approved for implementation so far.

	Unit.	1950-51	1955-56
Number of factories	..	21	27
Annual rated capacity	'000 tons	3,280	5,306
Actual production	'000 tons	2,692	4,800
Exports	'000 tons	29	300

30. GLASS

The glass industry comprises the manufacture of a variety of products which can be broadly classified as follows:—

(i) sheet glass,
(ii) blown and pressedware, and
(iii) bangles.

While articles manufactured in some categories may be classed as consumer goods, there are others which are required for industrial consumption and the building trade.

In addition to the manufacture of glassware in organised factories, there are a large number of small units working on a cottage industry scale, particularly for the manufacture of bangles and beads.

Although the industry applied for protection more than once, and its case was carefully examined by the Tariff Board and the Government, protection has been granted only to the sheet glass section since 1950.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There were 101 glass factories, including units manufacturing sheet glass but excluding those manufacturing bangles, with an annual rated capacity of 183,400 tons in operation in the country in 1950, and producing different kinds of glassware. The factories in operation in 1951 came to 109 and their regional distribution was as under:—

State	Number of units	Annual rated capacity (on the basis of 8-hour shift and 300 working days) Tons
West Bengal	30	63,600
Bombay	22	43,560
Uttar Pradesh	21	36,960
Madras	8	6,850
Bihar	8	16,380
Madhya Pradesh	5	4,220
Punjab and PEPSU	4	4,140
Delhi	2	1,200
Rajasthan	2	900
Hyderabad	2	3,960
Saurashtra	1	360
Mysore	1	720
Travancore-Cochin	1	600
Orissa	1	3,600
Madhya Bharat	1	1,800

Besides, there were 35 units with an installed capacity of 30,000 tons which had not been in operation for over three years, bringing the total capacity of all the units in the country to 218,850 tons per annum in 1951.

In the sheet glass section, there were three units in existence in 1950-51 with a combined rated capacity of 23·4 million sq. ft., equivalent to about 11,700 tons. The manufacture of bangles was undertaken by about 100 units, mostly established on a cottage industry scale and localised in the Ferozabad District (U. P.) and Belgaum District (Bombay). The rated capacity of these factories was estimated at 35,000 tons.

Actual production of glassware has shown a progressive increase in the last three years though it has been far below the rated capacity of the industry. As against 85,760 tons in 1949 and 103,270 tons in 1950, production increased to 112,743 tons in 1951. Substantial increases in production have been achieved in all sectors of the industry, other than bangles as indicated by the following break-up of production:—

Items	Production of Glassware		
	1949 (Tons)	1950 (Tons)	1951 (Tons)
Bangles	17,000	16,000	14,000
Bottle and phials	46,951	51,850	60,948
Table and pressedware	6,625	12,950	11,372
Lampware	9,937	13,150	15,362
Scientific glassware	1,987	2,137	1,970
Miscellaneous	1,324	1,985	3,291
Sheet glass	1,936 (3·5 million sq. feet.)	5,098 (9·57 million sq. feet.)	5,800 (11·1 million sq. feet.)
TOTAL	85,760	103,270	112,743

(b) *Capital and labour*.—The capital invested in the industry was estimated at Rs. 5·78 crores in 1951. According to the present value of equipment, it is expected to be of the order of Rs. 9·0 to 10·0 crores. The industry has developed mainly under private enterprise. However, some of the premerger State Governments such as Hyderabad, Travancore, Bharatpur and Dholpur, had participated in the development of this industry within their territories by subscribing to the share capital of the companies and/or advancing loans. Recently, the Industrial Finance Corporation has sanctioned a substantial loan for the completion of a sheet glass factory at Bhurkanda.

The total number of workers employed in the industry is about 26,000, excluding those engaged in cottage units. Of this, about 2,200 are engaged in sheet glass manufacture and about 600 in the manufacture of glass shells.

(c) *Raw materials*.—The principal raw materials required in the manufacture of glass are (i) substances of an acid nature like silica and boric acid and (ii) substances of an alkaline nature such as soda ash, potash, lime, dolomite, barium oxide, etc. The more commonly used raw materials are sand, borax, soda ash, salt cake, dolomite, lime or limestone, saltpetre, and decolourisers like manganese dioxide and selenium and colouring materials like sulphur and copper and cobalt oxides. The approximate requirements of

different raw materials for the production of 100,000 tons of finished glassware are estimated as under:—

Material	Source	Quantity
Soda ash	Imported (partially)	35,000 tons
Sand	Indigenous	100,000 „
Lime and limestone	„	16,000 „
Coal or equivalent fuel oil	„	175,000 „
Borax and boric acid	Imported	2,000 „
Liquid gold (for bangles only)	„	Value Rs. 24 lakhs
Selenium metal (powder)	„	Value Rs. 10 lakhs
Arsenic oxide	„	150 tons
Sodium nitrate	„	200 „
Potassium nitrate	Indigenous	400 „
Refractories	„	10,000 „

(d) *Imports and exports.*—Imports of glassware were of the value of Rs. 165 lakhs in 1948-49, Rs. 191 lakhs in 1949-50, Rs. 57 lakhs in 1950-51 and Rs. 214·73 lakhs in 1951-52. Exports worth Rs. 24·3 lakhs were made during 1947-48 and 1948-49; but these have contracted to Rs. 10 lakhs in 1949-50 and about Rs. 15 lakhs per annum during 1950-51 and 1951-52.

(e) *Estimated consumption and requirements.*—The requirements of different categories of glassware during the period of the Plan are discussed below:—

The demand for bangles has shown a progressive decline during the last three years. This is due to changing tastes and the introduction of bangles made of substitute materials like plastics. It is visualised that the demand during the period of the Plan would be maintained at a level of about 16,000 tons per annum. The importance of this section of the industry lies in the fact that it provides employment to a large number of artisans on a cottage industry basis. The programme for cottage industries should provide for extension of technical facilities and other steps to maintain production at the level mentioned above.

The demand for sheet glass has increased considerably in the last decade. The largest consumption takes place in big cities for requirements connected with building activity. The Railways and Public Works Departments of the Central and State Governments also constitute important customers for sheet glass, and the manufacture of safety glass contemplated by the Pilkington Safety Glass Ltd., would open up a new line of consumption of sheet glass. The average consumption of sheet glass during the triennium ending 1950-51 was about 16,000 tons per annum. It is envisaged that the domestic demand would increase to about 18,500 tons by 1955-56, assuming additional demand at the rate of one million sq. ft. per annum.

As regards blownware and pressedware, consumption of which during the triennium ending March 1951 has shown an increase of about 30 per cent. over consumption in 1948-49, it is estimated that the demand would go up to about 130,000 tons by 1955-56 assuming the same rate of increases in requirements. This demand might go up by an additional 5,000 tons, if the shortage of tin-plate, copper and brass persists in the country for the metal utensils industry and thus favourable conditions are created for the

substitution of metalware by glassware. A part of the increase in the consumption of blownware would be accounted for by glass shells for electric lamps, production of which has to be expanded in order to implement plans to raise the production of electric lamps to 30 millions by 1955-56. The target for electric lamps would increase the demand for glass shells to 32 million pieces by the end of the period of the Plan.

II. Problems of the Industry

(a) *Raw materials.*—The indigenous production of soda ash is not sufficient to meet the requirements of all industries. Further, the glass industry prefers dense soda ash which has not yet been produced in the country. Wide and frequent fluctuations in the availability and price of soda ash in the international market during recent times have caused considerable difficulty to the glass manufacturers.

Sand is another important raw material required by this industry and the quality of the present supplies is not always satisfactory. There is considerable scope for improvement through the establishment of washing plants by the manufacturers in their factory premises or of central washing plants at selected places to meet the needs of groups of factories. The quality of sand is an important factor affecting the glass industry and the State Governments of West Bengal, Bombay, etc., may, with advantage, follow the example of Uttar Pradesh Government by establishing at least some demonstration washing plants wherever necessary to guide small-scale operators.

(b) *Processes and techniques.*—The glass industry suffers from lack of modern technique and improvements. The delay in the adoption of improved methods of manufacture and in the installation of automatic and semi-automatic machines, has resulted in the industry remaining undeveloped in a number of new lines. Of the various products at present manufactured, only the sheet glass section is mechanised in regard to all major operations. In the blownware and pressedware section, only three of the existing factories are equipped with automatic machines. In so far as semi-automatic machines are concerned, although several factories are equipped with them, production is restricted substantially to a few items like bottles and pressed tumblers. The industry should examine the question of mechanisation and adopt it wherever possible to improve efficiency and lower the cost of production.

In regard to the manufacture of neutral glass, the present practice allows operations of tube drawing to be done by hand which makes ampoules more liable to breakage as they do not satisfy the limiting tolerances of automatic machines used for filling them. However, the problem would be solved by the installation of automatic tube drawing machines, particularly for handling neutral glass. An automatic plant for glass tubes in the Saraikella Glass Works capable of producing 3·5 to 4·0 tons per day has recently gone into operation.

The quality of the products is greatly impaired by the uncertainty in the standards of the raw materials used. It is, therefore, necessary to use raw materials of standard grade in order to improve and maintain the quality and finish of glass goods. The industry should also conduct investigations into the manufacture of new products and improvements of technique. There is considerable scope for the manufacture of a number of specialised items of glassware like optical glass, thermos flasks, neutral glass containers for the pharmaceutical industry and scientific glassware by the adoption of modern manufacturing technique.

III. Programme of Development

(a) *Existing programme.*—Some of the projects which were being undertaken at the commencement of the period of the Plan have been completed during 1951-52. Messrs. Vitrum Ltd., Bombay, and Bharat Glass Works, Bombay, have started production of opal and coloured glassware and bottles, respectively, and have a combined rated capacity of 4,400 tons per annum. Similarly, as mentioned earlier, an automatic plant for glass tubes in the Saraikella Glass Works capable of producing 3·5 to 4·0 tons per day of glass tubing for the manufacture of scientific glassware (test tubes, burettes, etc.) and ampoules has gone into operation. The capacity of all these units is included in the figure of rated capacity for 1951.

The following expansion projects and new schemes are now at various stages of implementation and formulation:—

Expansion Plan of the Glass Industry

	Name of the firm	Nature of development	Present annual capacity	Annual capacity on completion	Capital investment (Rs. in lakhs)	Year of completion
1.	Sodepur Glass Works, Bhurkanda, Bihar.	Sheet glass manufacture .	*Nil*	30·0 million sq. ft. (15,000 tons)	80·0	1952-53
2.	Ditto . . .	Bottles manufacture .	*Nil*	6,000 tons		1953-54
3.	Hindustan-Pilkington Glass Works, Asansol, Bengal.	Sheet glass manufacture .	*Nil*	21·0 million sq. ft. (10,500 tons)	(*a*)75·0	1953-54
4.	Saraikella Glass Works, Kandra, Bihar.	Expansion of sheet glass manufacture.	14·4 million sq. ft.	30·0 million sq. ft. (15,000 tons)	8·0	1952-53
5.	Hindustan National Glass Manufacturing Co., Rishra, West Bengal.	Bottles blownware and pressedware manufacture.	*Nil*	6,000 tons	15·0	1952-53
6.	Bharat Glass Works, Bombay.	Bottles manufacture .	*Nil*	3,000 tons	7·5	1952-53
7.	Mysore Glass and Enamel Works, Bangalore.	Syringes and special glassware manufacture.	*Nil*	0·6 million syringes (300 tons of tubing)	8·5	1953-54
8.	Pilkington Safety Glass Co.	Safety glass manufacture	*Nil*	0·5 million sq. ft.	(*b*)20·0	1953-54
9.	Vibhuty Glass Works, Benares.	Expansion of bottles manufacture.	2,400 tons	10,000 tons	13·0	1952-53
10.	Gauhati Glass and Silicate Works, Gauhati.	Lampware and bottles manufacture.	*Nil*	1,800 ,,	3·0	1952-53
11.	Alembic Glass Industries, Baroda.	Diversification of production by manufacture of penicillin vials.	*Nil*	3,600 ,,	10·0	1954-55
12.	International Exporters Ltd., Calcutta.	Thermos flasks manufacture.	*Nil*	10,000 dzs.	9·0	1953-54
13.	Glass and Miniature Bulbs Industries.	Thermos flasks manufacture	*Nil*	30,000 ,,	15·0	1953-54
4.	Hind Lamps Ltd., Shikohabad.	Expansion and Diversification—				
		Shells	7·0 millions	12·0 millions	(*c*)	1953-54
		Glass tubing and rods	*Nil*	450 tons		
15.	National Instruments Factory, Calcutta.	Optical glass manufacture	*Nil*	10—12 tons	(*d*)	1954

(*a*) & (*c*) Collaboration with foreign capital
(*b*) Entirely foreign capital
(*d*) Project in the public sector under the Ministry of Production

The completion of the above projects would require a capital investment of about Rs. 265 lakhs. A part of the investment (Rs. 40-50 lakhs) has already been incurred. As a result of these developments, there would not only be an increase in the volume of production of glassware, but also a diversification in the range of products manufactured which will have the effect of reducing imports of several items. The manufacture of penicillin vials would make neutral glass vials available to the projected penicillin factory from domestic sources. Similarly, dependence on foreign markets for such a strategic material as optical glass would be obviated with the coming into production of the optical glass unit of the National Instrument Factory. The rated capacity in the case of certain products like sheet glass and blownware and pressedware would be sufficiently large to provide satisfactory export surpluses.

(b) *Recommendations*—(i) *Additional capacity for glass shells.*—Though in most of the sectors of the glass industry the existing capacity supplemented by the developments mentioned above would meet domestic demand and provide for exports, the capacity for the production of glass shells for electric lamps would fall short of requirements by 1955-56 when they are expected to amount to 32 million shells. The gap between capacity and requirements would be of the order of 4 million pieces and facilities should therefore be given at the appropriate time, for bridging this gap. This development should be closely coordinated with the electric lamps industry. Establishment of a new unit for this purpose should only be envisaged if existing manufacturers do not find themselves in a position to expand their production of glass shells as the latter form of development might work out to be cheaper.

(ii) *Programme and targets of production.*—With the implementation of the projects mentioned above, the rated capacity of the glass industry excluding the bangles sector would increase from 213,250 tons on 1st April 1951 to 267,250 tons by 1952-53 and to about 290,000 tons by 1955-56. This capacity is considerably in excess of what might be considered necessary for meeting the demand during the period. However, it would create favourable conditions for competition and production at low cost which would have a beneficial influence on consumption in sectors of the glass industry where demand is elastic. The programme of production should envisage increasing utilisation of available capacity in such a manner as to take cognizance of shortage of raw materials, if any, as well as maintaining production in line with estimated domestic demand and the scope for exports. The latter are visualised at about 15,000 tons of glassware by 1955-56, of which 50 per cent. would be sheet glass and the rest blown- and pressedware. For achieving the export targets, the Government should afford assistance to the industry, if found to be necessary.

For meeting the domestic and export demands, it is necessary for the glass industry to achieve a production of 127,500 tons in 1952-53, and 163,500 to 168,500 tons in 1955-56 of all types of glassware other than bangles. The sheet glass section of the glass industry would have a very high rated capacity in comparison with estimated requirements when all the units go into production. In the circumstances, no additional capacity except for manufacturing such sizes as cannot be produced by the existing installations should be created during the period of the Plan. The indigenous sheet glass industry should produce all gauges and sizes of sheet glass so as to achieve self-sufficiency.

(iii) *Imports of glassware.*—Though the programme of development would bring about a diversification of production, it would still be necessary to import certain items like plate glass. It is estimated that the value of such imports would be of the order of Rs. 30 lakhs

in 1952-53 and Rs. 20 lakhs by 1955-56. For assisting the implementation of the schemes during the period of the Plan, Government should make the necessary adjustments in the import policy from time to time.

(iv) The glass industry must take a more active interest in research by greater co-operation not only among the manufacturers themselves, but also between the manufacturers and the various technological and research institutions. The example of the U. K. glass industry in contributing towards the maintenance of the Department of Glass Technology is recommended to the Indian glass industry.

The following table summarises the programme of development during the period of the Plan:—

	1950-51		1955-56	
	Annual rated capacity (Tons)	Actual production (Tons)	Annual rated capacity (Tons)	Actual production (Tons)
Bangles	35,000	16,000	35,000	16,000
Sheet glass	11,700	5,850	52,200	26,000
Blownware and pressedware, including glass shells for electric lamps	201,550	86,100	237,800	137,500 to 142,500
Safety glass (million sq. ft.)	..	..	0·5	0·5
Optical glass	..	..	12	10
Total (excluding bangles)	213,250	91,950	290,012	168,510

E. Liquid Fuel Industries

31. PETROLEUM PRODUCTS

Petroleum is one of the most important economic products of the day. It plays a vital role in the industrial and transport economy of every country and is of the utmost strategic importance both in times of war and peace.

The existence of oil resources is nature's endowment and India is not very fortunate in this respect. Her indigenous production is very small and hardly covers five to seven per cent. of her requirements. The search for oil, though it goes on, has not yet yielded any concrete results. India's oil economy is, therefore, mainly based on imports.

The countries of the world can be divided into two sections for the purposes of the oil trade. One section produces more oil than it can consume and so exports the surplus, whereas the other section imports oil to meet its full requirements or supplement its production. In international trade oil surpasses both in value and volume any other commodity. Even a highly industrialised country like the U. K. is almost wholly dependent upon imports, and the U. S. A., which at present produces more than 50 per cent. of the world's total oil production, is also a net importer.

Although India does not bear comparison with the highly industrialised countries of the world in regard to the *per capita* consumption of petroleum products, the demand for these products has been on the increase as shown by the following figures of imports:—

Imports of petroleum products into India

1948	2,113,000 tons.
1949	2,645,000 „
1950	2,889,000 „
1951	3,506,000 „

As against these figures, the indigenous production has been so insignificant that the national economy is at present dependent on imports for meeting nearly 95 per cent. of the total requirements. The development of a domestic petroleum industry will reduce this dependence and confer several direct and indirect benefits on the country, and must, therefore, receive a high priority.

The two projects which came up for consideration in this connection were (*a*) the setting up of synthetic plants for the production of oil from coal and (*b*) the establishment of refineries to treat imported crude oil.

Many countries in the world have been experimenting for a long time with the production of synthetic oil from coal. Although, during the last war, Germany was compelled by the exigency of her situation to produce such oil on an unparalleled scale, the fact remains that it has never been an economic proposition. The Government of India have also since 1948 been considering the possibility of setting up synthetic oil plants in the country and various schemes have been examined in this connection. The main difficulties are the huge capital investment needed and the doubtful economics of the proposition due to the comparatively high cost of production of synthetic oil. Refining

of crude petroleum, therefore, remains the universally accepted and most economical source of supply of these products and the establishment in India of refineries to treat imported crude must be regarded as the immediate objective.

Although the establishment of oil refineries near the sources of crude oil was the general rule before the war, it is no longer the position now. The establishment of refineries at port towns away from the crude oil production centres is now considered an economic proposition. The main reasons which have contributed to this change are the vast increase of home consumption of petroleum products in the U. S. A. making that country a net importer of oils, the world dollar shortage and the enormous increase in the crude oil production of the Middle Eastern countries. The great increase that has taken place in the demand for oils has also made it more economic to build refineries near the markets than near the sources of crude oil. These factors apply equally to India as to other countries.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—There is, at present, only one petroleum refinery in operation in the country which is located at Digboi in Assam. The plant is based on the exploitation of crude petroleum occurring in the neighbourhood and meets its requirements of sulphuric acid from a 10-ton contact sulphuric acid plant attached to the refinery. The various petroleum products manufactured at Digboi comprise motor spirit, kerosene, furnace oil, light diesel oil and smaller quantities of high speed diesel oil, mineral turpentine, solvent oil, etc., in addition to paraffin wax and petroleum coke.

(b) *Capital and labour.*—The capital invested in the Digboi refinery is £400,000. The number of persons employed by the Assam Oil Company as on 31st December 1951, was 7,423 out of which about 1,700 persons were employed in the refinery.

(c) *Raw materials.*—The Digboi refinery uses about 768 tons of sulphur per annum to manufacture sulphuric acid for its requirements. Its requirement of caustic soda is about 80 tons per annum.

(d) *Imports and exports.*—As mentioned already, domestic production is almost insignificant in comparison with the demand and has to be substantially supplemented by imports which in recent years were as under:—

Imports of petroleum products into India (excluding mineral grease and petroleum asphalt)

	Quantity		
	Million gallons	Million tons (estimated)	Value (Rs. Crores)
1948-49	536·5	1·99	35·8
1949-50	776·3	2·86	53·6
1950-51	779·5	2·90	55·0
1951-52	927·4	3·39	70·8

Imports of asphaltic bitumen amounted to 47,100 tons at Rs. 77·5 lakhs in 1948-49; 72,440 tons at Rs. 114·6 lakhs in 1949-50; 79,400 tons at Rs. 81 lakhs in 1950-51 and 37,114 tons at Rs. 93·5 lakhs in 1951-52.

Before the war, mineral oils were being imported from the East Indies, Burma and the Persian Gulf countries in tankers though the bulk of lubricating oil requirements were met by imports in packages from American crudes. Tanker voyages for moving oils from the

neighbouring countries being short, the number of tankers required was small. When supplies from Burma and the East Indies were cut off during the war, petroleum products had to be imported in larger quantities from the U. S. A. involving longer tanker voyages when the carrying capacity was in short supply. In the post-war period, the bulk of supplies has been obtained from the Middle East and also the Far East.

Paraffin wax is the only important petroleum product exported in considerable quantities. The export in 1950-51 amounted to 20,000 tons valued at Rs. 226 lakhs as against 15,500 tons in 1949-50 and 10,200 tons in 1948-49. The quantity of paraffin wax exported in 1951-52 was of the order of 32,000 tons.

(e) *Estimated consumption and requirements.*—The consumption of petroleum products in India has shown a considerable increase in recent years. Apart from industrial and electrical undertakings which consume considerable quantities of diesel oil, furnace oil and lubricating oils, the Railways also utilise petroleum fuels. According to the Central Water and Power Commission, the power industry consumed 87,000 tons of petroleum fuels in 1950 and the Railways accounted for 14·0 million gallons (about 60,000 tons) of fuel oil in 1949. Petroleum fractions are also consumed as aviation fuel and as solvents in certain industries such as the paint and varnish, fine chemicals and pharmaceutical industries.

Out of the total imports of petroleum products, three items, *viz.*, motor spirit, kerosene and furnace oil, account for nearly 75 per cent. The demand for motor spirit is going up every year with the increase in the number of motor vehicles on the roads. This may, however, partly be met by power alcohol which it is proposed to use in admixture with motor spirits as motor fuel. Kerosene is used as an illuminant throughout the country but its future consumption may go down with the completion of the various power projects which will no doubt help in giving more electricity for illumination. As regards furnace oil, apart from ships' bunkers, the textile industry is the main consumer. The cement, aluminium, iron and steel and glass industries will also use increasing quantities of this fuel. The other petroleum products the demand for which is likely to increase are diesel oils—used in industry and agriculture—vaporising oil—for agricultural tractors—jute batching oil—used in the jute industry—and lubricating oils for all machinery and moving parts. Generally speaking, the various development projects which are being undertaken in the country, *e.g.*, river valley and power projects, Grow More Food schemes, development projects of the Railways, the expansion of civil aviation and road development, etc., will need increasing quantities of these products from year to year.

It is, however, difficult to forecast precisely the future requirements of petroleum products, but it is expected that the demand will increase (from the actual consumption in 1951) by 30 to 40 per cent. during the period of the Plan.

II. **Programme of Development**

(a) *Existing programme.*—During the post-war period, the question of developing the petroleum industry in the country received the attention of the Government and institutions like the Council of Scientific and Industrial Research and the M. I. T. Alumni Association, Bombay, as well as of private enterprise. Messrs. Koppers Inc., who were appointed consultants to the Government of India in 1948, recommended the establishment of a synthetic petrol plant for the manufacture of 150,000 tons of different petroleum products using 1·7 million tons of non-coking coal from the Damodar Valley area. A modified

project was submitted by them in 1949 for producing aviation spirit, motor fuels and refined phenols simultaneously with domestic coke.

Messrs. Lurgi Gesselschaft also submitted a scheme for the production of synthetic petrol by a modified Fischer Tropsch process, but in view of the heavy capital expenditure involved, it has not been found possible to implement any scheme for the production of synthetic oils even though India has the advantage of abundant supplies of coal available in the country.

Proposals for the manufacture of petroleum products by refining imported crude were examined in 1948-49 by the Government in consultation with the oil companies already engaged in the distribution of these products in the country. At the Government's request, these companies arranged to send out to India a technical committee for making an investigation on the spot entirely at their expense. This committee carried out their investigations in India for three months and submitted their report to the oil companies and to the Government in 1949.

Before the report of the technical committee was submitted, however, the oil companies asked for certain assurances from the Government to enable them to examine the committee's report and to study the economics of the scheme. The matter was considered by the Government and it was decided that, subject to certain modifications, the assurances asked for might be given. The Government's decision was conveyed to the oil companies towards the middle of 1949. But the oil companies estimated that a large amount of capital would be necessary for establishing refineries in India and that the products of such refineries would be relatively more costly as compared with the imported finished products. For these reasons, they advised the Government that the proposals to erect a refinery in India to handle imported crude should be shelved for the time being.

Subsequently, the Planning Commission discussed various aspects of the question and recommended that while it was desirable to develop on a long-term basis both the refining and the synthetic processes, efforts should be renewed for the early establishment of one or more refineries. It was also evident that under the existing conditions, a petroleum refining industry could be established only with a preponderence of foreign capital and technical personnel. The Planning Commission also recommended consideration of the practicability of implementing the refineries scheme through individual foreign companies possessing adequate experience in this industry and having sufficient resources of crude oil.

Efforts were, therefore, renewed to find out whether the oil companies operating in India were now interested in the matter of building refineries in India. All the three major oil companies, *viz.*, Burmah-Shell Oil Storage and Distributing Co. of India Ltd., Standard-Vacuum Oil Company and Caltex (India) Limited, on being individually approached, showed their interest in setting up refineries in India and fresh negotiations started with them separately towards the end of 1951. As a result, schemes for establishing refineries have now taken final shape. The principal features of the development plans relating to the refineries are outlined in the following paragraphs.

(i) *Location and capacity.*—Two refineries with a total refining capacity of 3·2 million tons of crude petroleum per annum are to be erected at Trombay Island in Bombay by the Burmah-Shell group of London and the Standard-Vacuum Oil Company of New York. A scheme for a third refinery to be set up by the Caltex Co. at a suitable port town on the East Coast and having an annual refining capacity of one million tons of crude is also under consideration. It is anticipated that the Standard-Vacuum Refinery would go into

production in July, 1954 and the other by early 1956. The domestic requirements in the intervening years would, therefore, have to be met by imports.

(ii) *Finance for the projects.*—The total investment requirement for the two refineries is estimated at about Rs. 44 crores. A substantial portion of this investment would be raised by the oil companies as foreign capital in the form of equity capital and loans advanced by the parent companies. Preference share capital worth about Rs. 3 crores would be raised from the Indian market under specified conditions. Borrowings in India on a debenture basis are also visualised to the extent of Rs. 4 crores. The capital investment would, therefore, have the following pattern:—

Foreign capital and loan	Rs. 37 crores
Indian capital and debenture loans	Rs. 7 ,,

(iii) *Raw materials and power.*—The principal raw material is crude petroleum which will have to be imported. The annual cost of importing crude for the full operation of the two refineries (3·2 million tons) is estimated to be of the order of Rs. 30 crores c.i.f. Bombay. The material will be obtained from the Middle Eastern countries. The requirements of crude in 1955-56 are estimated at about 1·7 million tons, on the basis that the Standard-Vacuum refinery would operate over the entire year whereas the Burmah-Shell refinery would go into production in early 1956 only. Other manufactured materials required are sulphuric acid and caustic soda. While one of the companies will use a process which does not require sulphuric acid, the other company will require about 7,000 tons of sulphuric acid per annum. As the requirement of sulphuric acid is substantial, it would be necessary for the company to consider the installation of plants for the recovery of sulphur from tail gases or to manufacture sulphuric acid based on supplies of anhydrite imported from abroad from countries like Egypt. The requirements of caustic soda and sulphuric acid for the petroleum refineries have not been taken into consideration in the assessment of the demand for these two chemicals in the development plan for the Heavy Chemicals Industry. The requirements of power for the two refineries are estimated at 13,500 K. W. Suitable steps have been taken for arranging supplies of power by the time the plants go into production. The requirements of the Standard-Vacuum and Burmah-Shell refineries would be met from a new thermal power station to be set up at Trombay by Tatas.

(iv) *Production of petroleum products.*—The total production of the different petroleum products in 1955-56 (based on a full year's working of SVOC's refinery and three months' working of the Burmah-Shell refinery) is expected to be about 403 million gallons, exclusive of the quantities being produced already at Digboi (Assam). The total output of the two refineries when they go into full production in 1956-57 will be about 773 million gallons.

While it will still be necessary to continue imports of kerosene in substantial quantities to meet domestic requirements even after 1956-57, the imports of motor spirit and diesel oils will be necessary mainly to the extent of the anticipated increase in consumption up to 1956-57. Aviation spirit, lubricating oils and jute batching oil will have to be continued to be imported to the full extent of requirements, since these products will not be refined in India. Imports of fuel oils and asphaltic bitumen would, however, be almost entirely unnecessary as supplies would become available from the refineries and it may even be possible to export these products.

(v) *Advantages expected from the refineries.*—(*a*) Imports of petroleum products at present cost about Rs. 80 crores per annum by way of foreign exchange. The establishment of the two petroleum refineries would reduce this amount considerably, although crude

petroleum will still have to be imported. The net saving in foreign exchange as a result of this development would be of the order of Rs. 7 to 10 crores per annum.

(*b*) In the course of refinery operations, a large number of by-products would become available and in other countries these products have served as raw materials for important petro-chemical industries. The establishment of petroleum refineries in this country would facilitate the development of ancillary petro-chemical industries in due course.

(*c*) The petroleum refineries could facilitate the development of the gypsum-sulphuric acid industry visualised in the development plan for the sulphuric acid industry by providing a demand of sufficient magnitude in a single area to justify the establishment of a gypsum-sulphuric acid factory of an economic size.

(*d*) The petroleum refineries would train and employ personnel in various technical lines. It is expected that the establishment of two new refineries in India would provide employment to nearly 2,500 persons. Moreover, the technical operations involved in petroleum refining would provide extensive practical experience in complicated chemical engineering operations to Indian personnel which might later be available for assisting the establishment of other chemical industries in which similar unit operations are involved. The nucleus of technical personnel that would be built up by the petroleum refineries would thus be of considerable advantage to the country.

(*e*) The petroleum refineries would contribute to the public exchequer substantially from direct taxation, and the loss of indirect taxes in the form of customs duties would be made up by an almost equivalent amount in the form of excise duty on the products refined in India.

(vi) *Incentives for the development of the petroleum refining industry.*—(a) In view of the heavy capital investment necessary and the need for establishing refineries in the country through participation of foreign capital, certain incentives and assurances have been given to the oil companies.

(b) *Recommendation.*—As the two projected petroleum refineries do not envisage the production of certain types of petroleum products like jute batching oil and lubricating oil, the possibility of their manufacture being undertaken at the third refinery proposed to be established by the Caltex Company at Vizagapatnam should be examined.

The following table summarises the programme of development during the period of the Plan:

	1950-51	1955-56
Number of refineries	1	3*
Annual rated capacity in terms of refining petroleum crude ('000 tons)	250	2,000 (will be 3,450 in 1956-57).
Capital investment (Rs. crores)	0·6	44·6
Labour (Numbers)	1,700	4,200
Actual production—		
Liquid petroleum products (million gallons)	*N.A.*	†403 (will be 773 in 1956-57)
Bitumen ('000 tons)	*N.A.*	†37·5 (will be 150 in 1956-57).

N.A.—Not available.

*Work on one more refinery is expected to be started during this period ; but the refinery is not likely to come into production before 1956 and has therefore not been taken into account in these calculations. However, an investment of another Rs. 20 crores is expected to take place on this project during the period of the Plan.

†Exclusive of the present capacity.

32. POWER ALCOHOL

As a result of the rapid development of the sugar industry since 1931, large quantities of foreign exchange of over Rs. 13·5 crores. It should be possible to reduce these imports alcohol is a special grade of alcohol containing not less than 99·5 per cent. by volume of ethyl alcohol, while commercial spirits contain lower concentrations. The importance of the power alcohol industry lies in its supplying a product which can replace an equivalent quantity of imported petrol and which can be manufactured from indigenous resources. India imported in 1950-51 over 190 million gallons of motor spirit involving an expenditure of foreign exchange of over Rs. 13·5 crores. It should be possible to reduce these imports by nearly 20 million gallons when the power alcohol industry is fully developed.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—The Government of Mysore put up the first power alcohol distillery in India in 1939 and this was soon followed by another in the Hyderabad State. The subsequent development of the industry, however, took place in Uttar Pradesh where the State Government granted licences for the erection of 13 factories in 1942 and promised the necessary facilities. Several of these units came into production before the close of the war and the rest in the post-war period. At the beginning of 1951 there were 19 power alcohol distilleries established in different parts of the country.

The following table shows the geographical distribution as well as the capacities of the distilleries producing power alcohol or potable spirits and industrial alcohol:—

State	Factories producing power alcohol			Factories producing potable spirit and industrial alcohol	
	Number of units	Annual rated capacity in '000 bulk gallons		Number of units	Annual rated capacity in '000 bulk gallons
		Power alcohol	Commercial spirit		
Uttar Pradesh	12	8,640	2,155	6	1,850
Bihar	2	864	216	3	924
Bombay	2	1,100	19	3	1,267
Madras	..	..	..	5	2,044
West Bengal	..	..	..	3	1,104
Punjab and PEPSU	1	800	200	2	900
Hyderabad	1	717	179	..	..
Mysore	1	717	179	..	..
Vindhya Pradesh	..	..	..	1	240
Bhopal	..	..	..	1	180
Travancore-Cochin	..	..	..	1	180
Total	19	12,838	2,948	25	8,689

Of the nineteen distilleries producing power alcohol three were under erection in 1950 but have since gone into production.

Actual production of power alcohol has increased progressively in the post-war years, although it has been far below the installed capacity, as the following figures indicate:—

Year	Rectified spirit ('000 bulk gallons)	Power alcohol ('000 bulk gallons)
1948-49	2,279	3,890
1949-50	2,213	4,611
1950-51	3,452	4,716
1951-52	5,287	6,410

The gap between installed capacity and actual production of power alcohol has been mainly due to the shortage of molasses and difficulties of transport and lack of off-take of power alcohol.

In addition to power alcohol, some industrial alcohol is simultaneously produced in the power alcohol distilleries and is supplemented by the production of distilleries manufacturing only commercial spirit and potable liquor. Shortage of molasses was experienced by some distilleries particularly in Western U. P. and PEPSU and the factory in PEPSU has not been in a position to produce any power alcohol so far. The Kolhapur and Nasik Distilleries in Bombay State could not come into regular operation because the use of power alcohol has not been introduced so far in that State. In the Mysore State, production and use of power alcohol has been stopped for some time due to an increase in the cost of production and denaturing and to scarcity of water.

(b) *Capital and labour.*—The industry has been developed by private enterprise except in Mysore and Hyderabad States and at Nasik in Bombay State where the State Governments either own the distilleries or have an interest in them. The capital invested in the power alcohol industry in 1951 is estimated at Rs. 158 lakhs and the distilleries when operated at full capacity can provide employment to 1,700 workers.

(c) *Raw materials.*—The principal raw material required is molasses and its production in the different States is as follows:—

	1950-51 ('000 tons)	1951-52 (estimated) ('000 tons)
Uttar Pradesh	201	300
Bihar	75	87
Other States	141	163
Total	417	550

In addition, 2,000 tons of molasses were available from the gur refineries and 75,000 tons from the *Khandsari* sugar industry.

Normally, one maund of molasses of satisfactory quality yields about 2·2 gallons of alcohol in the form of power alcohol and commercial spirit taken together, but the yields in India have so far been only about 1·7 gallons, these low yields being ascribed to the inferior quality of molasses supplied by the sugar factories. Other raw materials required in small quantities are: sulphuric acid, ammonium sulphate, and entraining agents such as benzene, mixed acetates or glycerol. Under efficient operating conditions approximately 6 pounds of coal per gallon of alcohol are required for raising steam but in actual practice the consumption has been 12 pounds per gallon.

(d) *Imports and exports.*—Alcohol is not imported as such but small quantities enter the country in association with drugs and perfumed spirits or in the form of liquors. Exports of alcohol are confined to despatches of potable liquor only. Lately a small quantity of denatured spirit has also been exported.

(e) *Estimated consumption and requirements.*—The demand for power alcohol is closely related to the consumption of petrol which has been gradually increasing from year to year. On the basis of an estimated consumption of nearly 198 million gallons of motor spirit in 1950 the requirements of power alcohol on the basis of using it in the ratio of 80:20 would be roughly 39·6 million gallons. Even assuming that the entire molasses ultimately available is converted into power alcohol, it would be possible to produce only about 22 to 24 million gallons of power alcohol and commercial spirit together. In the circumstances, the maximum quantity of power alcohol which can be produced from the available molasses would meet only 50 per cent. of the possible demand for its use in admixture with motor spirit. Although at present the existing capacity for power alcohol is not fully utilised for other reasons, the development of this industry will ultimately be limited by the lack of raw materials unless, after utilising fully all the available molasses, recourse can be had to alternative raw materials.

In addition to assessing the demand for power alcohol it is also necessary to consider the possible demand for commercial spirits simultaneously produced. The present demand for rectified spirit from the pharmaceutical industry is placed at 400,000 gallons. In addition, small quantities are consumed in the manufacture of chemicals such as acetone, chloroform, ether, etc., and the principal demand for the remaining alcohol is in the form of denatured spirits or as potable liquors. There are also possibilities of using commercial spirits for other industrial purposes such as the manufacture of organic chemicals, chlorinated solvents, polyvinyl chloride, DDT., etc. On the basis of a production of 700 tons of DDT per annum in the country in the next five years approximately 80,000 gallons would be required per annum. The implementation of the acetate rayon project of Sirsilk Ltd. in Hyderabad and the manufacture of acetone and acetic acid by them, would lead, on the basis of the installed capacity of the plants, to a consumption of 1·2 million gallons of alcohol (commercial spirits). In the future, therefore, as increasing quantities of commercial spirits become available, new industries consuming them might develop gradually. Efforts might also be made by the power alcohol distilleries to adjust the production of commercial spirits suitably according to the relative demand for power alcohol and commercial spirits.

II. Problems of the Industry

The main problems of the industry relate to (i) availability of molasses, (ii) organisation of the disposal of power alcohol, (iii) high cost of production, (iv) handling losses involved in the system of delivery of power alcohol to State Governments, and (v) high charges paid to oil companies for blending and marketing power alcohol-petrol mixtures.

(i) *Availability of molasses.*—Although the installed capacity of the industry is still insufficient to handle the entire quantity of molasses available, there are areas where distilleries are experiencing considerable difficulty in obtaining this raw material. This is due to the fact that molasses is also consumed for curing tobacco and in the manufacture of potable liquors and rectified spirit. The demand for illicit distillation has also, perhaps,

accentuated the shortage. The production and consumption of molasses in U. P., the main producing State in recent years, are given in the table below:—

Production and disposal of molasses in U. P.

Year	Production	Consumption: By power alcohol distilleries	Consumption: By potable liquor distilleries	Released for sale to trade and states (including wastage)
	Tons	Tons	Tons	Tons
1944-45	81,300	14,000	23,100	44,000
1945-46	178,200	43,340	21,700	112,800
1946-47	163,660	62,680	17,000	84,100
1947-48	232,500	75,000	16,600	140,900
1948-49	185,000	103,000	21,500	60,200
1949-50	156,600	101,000	18,400	36,200
1950-51*	201,700	157,000	28,500	Not available

The distilleries in Punjab and PEPSU have been experiencing difficulty in securing their requirements of molasses from U. P. and shortages are experienced by factories even within U. P. on account of the difficulties in the transport of molasses over long distances and due to the lack of proper storage facilities to prevent deterioration.

(ii) *Disposal of power alcohol.*—It would be possible for the production of power alcohol in U. P. greatly to exceed the State's total requirements even if the use of the mixture was extended to the whole of the State. The problem of surplus alcohol will therefore present itself in due course, unless arrangements are made for its use in neighbouring States. In future it will be necessary to arrange for the proper distribution of power alcohol both within and outside the State so as to utilise the installed capacity of the industry fully.

The present arrangement for the purchase of power alcohol from distilleries by individual State Governments and the distribution of the mixture at the same price as neat petrol by the petroleum companies appears to militate against the wider adoption of power alcohol as motor fuel. The sale of power alcohol as motor fuel provides revenue to some State Governments but is likely to cause others continuous losses. The taking over by an all-India agency of the distribution of all the power alcohol produced or the termination of the present arrangement of selling petrol and power alcohol blend at the same price as petrol in each area, might help to solve this difficulty.

(iii) *High cost of production.*—The cost of production of power alcohol is high not only because of high fuel consumption but also because of the low grade of molasses supplied by a number of sugar factories. If molasses can be universally stored in covered storage tanks and the operation of the distilleries made continuous and carefully regulated, it should be possible to bring down the costs of production.

(iv) *Transit and handling losses.*—The distilleries supply alcohol to the State Governments and pay excise duty on the quantity delivered. But they are given credit only for the quantity actually mixed with petrol by the petroleum companies and it is reported that unavoidable transit and handling losses sometimes up to 1·5 per cent. of the

*Estimated consumption by outstill shops was 4,636 tons.

alcohol result and the distilleries not only do not receive the price of such alcohol actually delivered by them but are also called upon to pay excise duty on such losses.

(v) *High charges paid to oil companies.*—The present handling charges paid to the oil companies for the blending and marketing of power alcohol-petrol mixtures were originally fixed at 5 annas per gallon of power alcohol used and they have fluctuated between 5 annas and 7 annas a gallon. The opinion has been expressed that these charges are still high and some reduction is possible which should help to encourage such State Governments as are likely to sustain losses with the compulsory use of the power alcohol-petrol mixture as motor fuel. This aspect, however, is closely linked with the constitution of a central agency discussed under (ii) above.

III. Programme of Development

(a) *Existing programme.*—All the new distilleries projected in earlier years have come into operation and there are no distilleries under construction. However, plans for the installation of the following distilleries are under consideration:—

(i) One power alcohol distillery at Jaora in Madhya Bharat State with a rated capacity of 500,000 gallons per annum. The unit was envisaged to be put up with the financial assistance of the State Government but according to present arrangements it would be necessary for the unit to be put up entirely by private enterprise.

(ii) Four new power alcohol units in the Madras State—at Nellikuppam, Vuyuur, Visakhapatnam and Hospet with a combined annual rated capacity of 1·45 million gallons. It is expected that these units would come into operation in 1952-53 and the present installed capacity of the industry would then increase to 14·5 million gallons of power alcohol and 2·95 million gallons of commercial spirits. The implementation of the above schemes requires a capital investment of about Rs. 20 lakhs.

Simultaneously with the installation of the above new distilleries, it will be necessary to expedite the work in progress in the matter of extending the use of power alcohol to suitable regions in U. P., Punjab and the neighbouring areas. So far, the use of power alcohol-petrol mixture has been restricted in the absence of the necessary extensive arrangements for blending and distribution over larger areas. It is expected that the further arrangements in hand in this direction will be completed in the course of the next 12 to 18 months so that with the coming into existence of the additional storage and distribution facilities more areas in and around U. P., Punjab, Rajasthan and PEPSU would begin to consume increasing quantities of power alcohol.

(b) *Recommendations.*—The development plan of the industry should be on the following lines:—

(i) The industry should be enabled to work at full capacity—

(*a*) by extending the use of petrol-alcohol mixtures to all the areas adjoining the manufacturing units to the maximum extent possible. The provision of additional mixing depots and storage facilities and distribution arrangements should be given high priority;

(*b*) by facilitating transport of molasses from the sugar factories to the distilleries and of power alcohol from the distilleries to the consuming centres; and

(*c*) by facilitating proper distribution of power alcohol both within and outside the States.

(ii) In the 1951-53 period, no new distilleries should be put up except where, on an examination of the individual merits of any project, the Government are satisfied that it should be allowed. The existing distilleries should be enabled to bridge the gap between installed capacity and actual production and the units under active consideration in Madhya Bharat and Madras States should be established. The establishment of any new units should be taken into consideration during the second half of the period of the Plan after the projected expansion has been achieved and the use of power alcohol and petrol mixtures has been expanded.

(iii) In the 1953-56 period, the installation of 7 new units is necessary to take advantage of additional supplies of molasses which may become available with the increased production of sugar. Four of them with a combined annual productive capacity of 3·6 million gallons might be located in Bihar and the remaining three with a productive capacity of 1·5 million gallons in Bombay, care being taken to locate these units either in conjunction with or in proximity to sugar factories. The actual siting requires detailed examination in the light of the suggestions for shifting sugar factories discussed in the plan for the sugar industry, as well as the location of petrol depots and the off-take of motor spirit in the particular area.

(iv) Some of the power alcohol distilleries situated in areas where supplies of molasses cannot easily be made may have to be shifted to more suitable locations. The particular instance which requires to be mentioned here is that of a distillery in PEPSU. The U. P. Government should examine the possibility of making the requisite amount of molasses available. If they are unable to do so, facilities should be provided for shifting this distillery to a more suitable location.

(v) A certain amount of molasses is sold by the U. P. Government to private traders and to other States. The question of utilising such resources for enabling the fuller operation of the existing distilleries in neighbouring areas or for expanding the capacities of some of the distilleries in U. P. to secure an additional production of 1·2 million gallons should be examined in detail. This requires close correlation with the plans for the shifting of sugar factories from areas where cane is not available in sufficient quantities to more suitable places within the States or outside. A total capital investment of the order of Rs. 60 to Rs. 65 lakhs will be necessary for the new units envisaged under (iii) and the expansions discussed above.

(vi) The Central Government should examine the present arrangement between distilleries and State Governments for taking over the product and getting it distributed through petroleum companies. The establishment of an all-India agency for acquiring the output of all the distilleries and making necessary arrangements for its distribution in the form of petrol-alcohol mixtures through the petroleum companies should help to extend the use of the mixture and step up consumption of power alcohol.

(vii) Till the use of petrol-alcohol mixtures is extended, it will be necessary to give some form of encouragement to the use of denatured alcohol in trucks, agricultural tractors and other i. c. engines. The Government should consider the possibility of assisting the same by granting rebate of excise duty on alcohol or in other forms.

The extensions and new units suggested above should enable a target of 23·6 million gallons of power alcohol previously recommended by the Panel on Power Alcohol and Food Yeast Industries (1947) to be nearly realised.

The following table summarises the programme of development for the power alcohol Industry during the period of the Plan:—

	Unit	1950-51	1955-56
Installed capacity—			
(*a*) Power alcohol	Million gallons	12·87	21·12
(*b*) Commercial spirit	,,	12·65	2·95*
Actual production—			
(*a*) Power alcohol	,,	4·72	18·0
(*b*) Commercial spirit	,,	3·5	2·0

*Refers to power alcohol distilleries only.

F. Textile Industries

33. COTTON TEXTILES

The cotton textile industry, which is the largest single industry in the country, has made rapid strides during the century of its existence. India holds the third place among the countries of the world in its capacity for yarn and cloth based on the number of spindles and looms installed and holds the second place on the basis of the consumption of raw cotton by the industry. In addition to providing means of livelihood for nearly 10 million handloom weavers, the mill industry alone provides at the present time employment to about 800,000 workers.

The main divisions of the industry are:—

(i) the mill industry producing yarn and cloth;

(ii) the small power-loom factories producing cloth from mill-made yarn; and

(iii) the widely distributed handloom industry producing cloth both from mill-made and hand-spun yarn.

In addition to these sections, there is a fourth group consisting of the textile processing industry for the bleaching, dyeing and printing of different varieties of cloth made by any of the above groups of producers. But the processers do not add to the total quantum of cloth produced in the country; they only process it to meet specific requirements. In the plans visualised below, attention has, therefore, been confined only to those sections which contribute to the largest production of cotton textile goods in the country, *i.e.*, the mill textile industry and the handloom industry.

I. Brief Survey of the Industry

(1) *Mill industry*.—The mill textile industry comprises two sections, *i.e.*, spinning mills and composite mills. By April 1951, there were in the country 103 spinning mills with an annual rated capacity of 1,814,961 spindles and 275 composite mills with a rated capacity of 9,127,280 spindles and 194,411 looms. Of these, 34 units came into existence in the post-war period with a total of 472,050 spindles and 3,880 looms. Between April 1951 and March 1952, the rated capacity of the textile industry increased by 159,420 spindles and 988 looms with the commencement of production by 16 new mills. In addition, 13 mills are now under construction with a total capacity of 73,622 spindles and 450 looms. Six of the mills under construction with 27,202 spindles and 100 looms are expected to go into production shortly.

On the basis of an average working on a two-shift basis for 305 working days, the rated capacity of the mill industry in April 1951 was sufficient to produce 1,668·7 million lbs. of yarn and 4,744 million yards of cloth per annum. In calculating the capacity, it is assumed that each spindle would produce 4 oz. of yarn per shift and each loom would produce 40 yards of cloth per shift.

Over 60 per cent. of the spindles and looms are concentrated in the Bombay State, the balance being distributed largely in South Madras, Madhya Pradesh, Uttar Pradesh and Madhya Bharat. The regional distribution of the industry is given in Appendix I.

The industry is operated almost completely in the private sector, the only exceptions being some mills in Travancore-Cochin and Orissa which were developed with State assistance. The managing agency system has played a large part in the development of this industry, but the adoption of it has, in some cases, led to the formation of groups of concerns and concentration of power in the hands of a few entrepreneurs. The sizes of mills vary widely, some of them containing as many as 100,000 spindles, while there are others with less than 10,000. In the case of composite mills also, there are units having less than 200 looms, while others work with more than 2,000. According to the Report of the Post-War Planning Committee, a composite mill having 25,000 spindles and 600 looms should be regarded as an economic unit under Indian conditions.

The mill industry in the early stages of its development produced only coarse varieties of cloth and the finer grades were either imported from abroad or manufactured by the handloom industry. Gradually, as the Swadeshi Movement gained strength and imports were reduced, the mill industry responded to the increasing demands for fine and superfine cloth and the production programmes of the mills were suitably adjusted. Consequently, today, the country is in a position to depend on domestic sources for meeting almost its entire requirements in respect of the different varieties of cloth and also to export substantial quantities to other countries, provided the industry is ensured of adequate supplies of raw cotton.

(b) *Capital and labour.*—The capital invested in the mill industry is estimated at Rs. 100 crores and the annual turnover at between Rs. 350 to Rs. 400 crores, depending on the fluctuations in the prices of raw materials and products. The number of workers employed depends on the number of shifts worked daily by the mills. In 1950, the average number of labourers employed per day ranged between 715,000 and 770,000.

(c) *Raw materials.*—There are a large number of raw materials and stores required by the industry and the important ones are given in Appendix II. Of these, cotton is the most important. Since partition, it has become difficult to meet the full requirements of the industry because a disproportionately large acreage under cotton has fallen to Pakistan in comparison with the rated capacity of the cotton textile industry located in that area. In 1938-39, the area under cotton in the territories now comprising the Indian Union was about 20 million acres and, on an average of 4 to 4·5 acres to a bale of cotton, production of cotton was of the order of 4·5 to 5 million bales. In 1949-50, the acreage under cotton was only 12 million, though it is reported to have increased by 10 per cent. in 1950-51. Against the requirement of 5 million bales of cotton for working the industry, including the mills which have closed down, to its full rated capacity, the actual production of cotton during 1949-50 was 2·628 million bales and 2·926 million bales in 1950-51.

During 1948-49, the consumption of cotton by the mills was 4·25 million bales, and during 1949-50 it went down to 3·68 million bales. Even these quantities could be supplied only by supplementing domestic supplies to the mills with imports of about 1·078 million bales during 1948-49 and 1·25 million bales in the year 1949-50. Foreign exchange difficulties and uncertain trade relations with Pakistan were the reason for low imports of cotton and loss of production thereby.

The quantities of the other important raw materials and stores items required for maintaining production based on 4·2 million bales of cotton are given in Appendix II.

(d) *Power and fuel.*—Most of the units of the mill industry generate their own electric power using diverse types of prime-movers operated with steam, diesel oil, etc. Whenever

possible, they supplement such power by purchasing part of the requirements from public utilities. Approximately 140,000 tons of coal per month are required by the industry and this is in addition to fuel oil also consumed and power purchased by some of the mills. The power consumed by the industry in 1949 came to 168·0 million Kw-hr, out of which about 19 per cent. was purchased from electricity undertakings, public and private.

(e) *Actual production.*—Actual production of yarn is dependent on the intensity of the utilisation of the spindleage in existence. The larger the number of spindles working on double and triple shifts, the greater the production of yarn. During 1949 and 1950 the spindleage in existence was operated as under:—

Year	Spindles installed as on 1st January	Average spindles worked		
		First shift (8 hours)	Second shift (8 hours)	Third shift (6½ hours)
1949	10,366,257	9,311,471	8,340,060	2,692,728
1950	10,554,455	9,011,958	8,008,804	2,052,812

There is some possibility of increasing the production of yarn if a larger number of spindles could be made to operate for the third shift.

The actual production of yarn and cloth from 1948 onwards was as follows:—

Production of yarn and cloth by the mills

Year	Yarn ('000 lbs.)		Cloth ('000 yards)				
	Production	Consumption by mills	Coarse	Medium	Fine	Superfine	Total
1948	1,447,616	1,036,925	797,620	2,580,567	601,429	339,687	4,319,303
1949	1,359,119	963,214	452,068	2,309,169	809,240	333,726	3,904,203
1950	1,174,220	872,675	421,819	1,781,436	1,200,453	261,383	3,665,091
1951	1,303,861	987,376	363,561	2,080,858	1,347,946	283,866	4,076,186

The main reasons generally adduced for the short-fall in production during 1949-51 in comparison with 1948 are shortage in the supplies of raw cotton and the electric power cut on account of shortage of water in the Bombay and Madras areas. The problem of power shortage was overcome to a certain extent by the installation of small generating sets in the mills. As a result of recent improvement in the cotton supply position, production has registered an increase in 1952 when the yarn and cloth output in the first seven months went up to 814·0 million lbs. and 2,587·2 million yards respectively.

After the Industrial Truce, major labour unrest was not responsible for any large fall in production till the last strike in the textile mills in Bombay city during the year 1950, which lasted for nearly 2 months and affected the year's production considerably.

(2) *Small-scale powerloom and handloom industry*—(a) *Location, rated capacity, structure and organisation.*—This section of the textile industry is of considerable importance from the standpoint of providing large-scale employment in rural areas and

enabling an increasing number of entrepreneurs in the smaller cities to engage in the weaving industry. Accurate statistics of handlooms are not available. At the present time it is estimated there are 2,850,000 handlooms and 23,800 powerlooms in existence in the country. About 65 per cent. of the powerlooms are located in the Bombay State and the handloom industry has witnessed the largest development in the Madras State which accounts for about 30 per cent. of the total number of handlooms. The distribution of the powerlooms and handlooms in different States and their requirements of yarn are estimated as under:—

State	Number of power-looms with Textile Marks allotted	Annual yarn requirements (a) (million lbs.)	Number of handlooms	Annual yarn requirements (b) (million lbs.)
Bihar	147	0·72	196,218	47·10
Bombay	15,742	76·82	161,255	38·70
Madhya Pradesh	1,123	5·48	105,000	25·20
Madras	1,415	6·91	841,140	201·87
Orissa	10	0·05	129,686	31·12
Punjab	1,339	6·53	46,357	11·13
Uttar Pradesh	342	1·67	253,311	60·69
West Bengal	1,354	6·61	97,151	23·32
Hyderabad	167	0·81	149,000	35·76
Madhya Bharat	24	0·12	18,500	3·72
Mysore	1,303	6·36	35,000	8·40
Rajasthan	36	0·18	26,000	6·24
Saurashtra	269	1·40	20,000	4·80
Travancore-Cochin	10	0·04	80,157	19·23
Ajmer-Merwara	10	0·05	2,016	0·48
Delhi	481	2·35	750	0·18
Other areas	28	0·01	190,164	166·46
TOTAL	23,800	116·11	2,851,685	684·40

(b) *Actual production.*—There are no statistics available regarding the production of cloth by powerlooms. However, it is known that, at the present time, the powerlooms are not getting their full requirements of yarn and, therefore, there is a considerable short-fall in production. The actual production of the handloom sector of the industry which had shown a remarkable expansion during the second world war when it reached a peak figure of 1,700 million yards per annum, registered a fall in the subsequent period and in 1950 it was as low as 810 million yards as against 1,250 million yards in 1948 and 1949. Production of cloth by the handloom industry in 1951-52 has been estimated at 924 million yards. The short-fall was due to non-availability of yarn to meet the full requirements of the handlooms apart from the reduction in the number of handlooms in existence in the Indian Union due to partition. The non-availability of yarn has caused considerable distress in rural areas and to a large number of workers dependent on handloom weaving. The production of yarn has improved in 1952 as a result of which large quantities are being made available to the handlooms industry. But at the present time difficulties of marketing handloom cloth have been affecting production and leading to unemployment and distress.

(a) Based on 305 working days and double shift operation and at the rate of 8 lbs. of yarn per shift.
(b) Based on 305 working days and at the rate of 20 lbs. of yarn per month.

(3) *Exports.*—While India was an important importer of cotton textiles both from the U. K. and Japan for several years, today she has become one of the principal producers and exporters of cotton textiles in the world. Demand for Indian textiles has been on the increase although this might, to a large extent, be ascribed to the present lower prices of Indian products, particularly the varieties manufactured with the cheaper indigenous cotton, in comparison with the prices of goods from other countries.

Exports of yarn and cloth in recent years were as follows:—

Sea-borne exports of yarn and cloth

Year	Twist and Yarn		Cloth	
	Million lbs.	Rs. crores	Million yds.	Rs. crores
1948-49	7·4	1·3	340·92	36·2
1949-50	64·9	11·8	700·86	59·1
1950-51	74·5	17·1	1,269·66	116·7
1951-52	6·2	2·0	423·82	42·6

In addition to sea-borne exports, there is some export over the land frontiers, the principal customers being Pakistan and Afghanistan. These exports amounted to 7·9 million yards of cloth and 2·98 million lbs. of yarn in 1949-50. In 1950-51, such exports amounted to 0·63 million lbs. of yarn and 13·7 million yards of cloth.

In connection with the exports in 1949 and 1950, a few words of explanation are necessary, particularly in the face of the cloth shortage in the country and the necessity for restricting exports in 1951-52. The principal reasons for the export of cotton textiles and yarn appear to have been:—

(i) to increase the country's foreign exchange earnings in order to provide funds necessary for importing cotton and other essential goods; domestic cotton production being totally inadequate, import of foreign cotton is essential to enable the industry to remain in production even to the extent that it has done; and

(ii) to take advantage of the prevalent demand in other countries for Indian yarn and textiles so as to build up an export market.

A logical method of meeting the situation might consist of importing cotton and exporting the goods manufactured from it so that this country would have the advantage of maintaining production in its mills and also of retaining for domestic consumption the cheaper goods manufactured from cheaper cotton; but unfortunately keen competition in the different markets of the world, the high price of foreign cotton and the comparatively higher costs of production in Indian mills have been working against the adoption of such a system.

In addition to the exports of finished cotton textiles and yarn, cotton waste to the extent of 50,832 tons valued at Rs. 5·15 crores in 1948-49, 75,623 tons valued at Rs. 8·22 crores in 1949-50, 65,166 tons valued at Rs. 12·41 crores during 1950-51, and 31,016 tons valued at Rs. 7·31 crores in 1951-52 was exported from the country.

(4) *Imports.*—Imports of all types of cloth and yarn except (*a*) umbrella cloth and special fabrics; (*b*) yarn counts of 80's and above required for handloom purposes; and (*c*) yarn counts of 30's and 60's for manufacture of healds and reeds are at present

prohibited. The figures of such imports even on a restricted scale during 1949-50, 1950-51 and 1951-52 are as under:—

Imports of cotton manufactures into India

	1949-50		1950-51		1951-52	
	(lbs. '000)	(Rs. lakhs)	(lbs. '000)	(Rs. lakhs)	(lbs. '000)	(Rs. lakhs)
COTTON MANUFACTURES—						
Twist and Yarn—						
Total *grey* (unbleached)	12,803·9	515·9	238·4	14·6	1,270·4	142·5
Total *white* (bleached)	336·2	18·4	78·1	6·2	58·3	7·3
Total *coloured*	89·6	3·9	7·3	0·6	11·4	1·4
Total *mercerised*	426·6	25·0	36·4	4·6	33·9	5·1
Piecegoods—						
Grey (unbleached)	26,722·6	169·4	690·5	6·7	330·6	9·6
White (bleached)	10,657·6	334·3	1,948·8	45·5	1,436·2	40·9
Coloured, printed or dyed	27,043·7	567·3	3,094·9	78·2	6,110·9	185·9
Goods of cotton mixed with other materials	10·7	0·3	..	..	..	..

(5) *Estimated consumption and requirements*—(i) Mill yarn.—Mill yarn is consumed by composite mills for weaving cloth and the surplus remaining after meeting export commitments is made available to the State Governments under the All-India Yarn Distribution Scheme. About 75 per cent. of this surplus yarn is supplied to the handloom industry and the balance is distributed to other consumers such as powerlooms, hosiery factories, jute mills and manufacturers of fishing nets, cotton braid, cotton tape, sewing thread and newar. Though yarn is also used by powerlooms for the production of cloth, which augments the supplies of cloth from mills and handlooms, no estimate has been made of the cloth available from this source for want of statistics of the past trends of production.

The total demand for yarn in 1950-51 was estimated to be 1,104 million lbs. made up of 885 million lbs. for direct consumption by textile mills, 164 million lbs. for handloom and 55 million lbs. for miscellaneous industries apart from 73·1 million lbs. exported during that year. It has been estimated at 1,331 million lbs. in 1951-52 and is expected to increase to 1,500 million lbs. in 1952-53; and to 1,630 lbs. by 1955-56 according to the future programme envisaged.

(ii) Cloth.—Cotton cloth (mill-made and handloom) available for consumption *per capita* averaged about 15 to 16 yards during the pre-war years. Against a *per capita* consumption of 15·4 yards of cloth in 1948-49 and 12·5 yards in 1949-50, the consumption during 1950-51 was estimated to be only 9 yards. The *per capita* consumption in 1951-52 was estimated at 12·5 yards on the basis of the estimated production of cloth both by the mill and the handloom sections and after making the necessary allowance for exports. The scarcity of cloth in 1950 was due to heavy exports during the early part of the year and to a large part of the export quota permitted for the year being despatched within a short period. Bearing in mind (i) the present high cost of living in comparison with pre-war years, (ii) the fact that areas in which consumption of cloth was relatively higher such as West Punjab and the North-West Frontier Province, no longer constitute part of the Indian Union, and (iii) the necessity from considerations of balance of payments to maintain exports of textile manufactures at a high level, the targets of *per capita* consumption of

cloth have been fixed at not less than 13 yards in 1952-53, which should be progressively increased to 15 yards by 1955-56. According to the production and exports envisaged for 1952-53, the cloth available for domestic consumption would provide 13 to 14·0 yards for each individual and *per capita* availability would increase to 15 yards by 1955-56. In calculating the availability of cloth account has also been taken of supplies from the khadi and powerloom sectors.

(6) *Marketing and distribution.*—For some time no mill was allowed to sell any of its output without the permission of the Government. But subsequently, as stocks began to accumulate and the off-take from the mills became less regular, they were allowed to sell one-third of their cloth production to buyers of their own choice, only two-thirds being distributed to the various States nominees on the instructions of the Textile Commissioner. Further relaxations have been made in the distribution system of cloth. New mills can sell the entire production of fine and superfine cloth and 80 per cent. of coarse and medium cloth to buyers of their choice.

II. Problems of the Industry

(i) *Shortage of cotton.*—The most important problem of the mill industry is the shortage of cotton. Partition has acutely affected the position of the cotton textile industry in regard to domestic supplies of cotton. The Agricultural Plan envisages increased production of cotton from 2·971 million bales in 1950-51 to 4·229 million bales in 1955-56. It is also envisaged that the production of short staple cotton would be considerably reduced by a change-over to the medium and long staple varieties. Though this would bring down the exports of short staple cotton, the importance of this development lies in the fact that the textile mill industry could count upon a larger availability of indigenous cotton of the required quality. Assuming that about 350,000 to 400,000 bales of cotton would be required for the various miscellaneous industries and for khadi, it is estimated that about 3·3 million bales of domestic cotton would be consumed by the mill industry in 1952-53 and 3·7 million bales in 1955-56. The cotton deficit for attaining the targets of yarn production would come to about 1·2 million bales and annual imports throughout the period of the Plan are expected to be of that order. If it is found that a larger quantity of *desi* cotton has to be exported in any year owing to lack of adequate off-take from the domestic mill industry, it might become necessary to increase cotton imports *pro-rata*.

(ii) *Uneconomic units.*—The next important problem of the industry is the existence of about 150 inefficient and uneconomic units. 25 of these units closed down some time ago and it is reported that another 35 are operating at a loss. In addition to these 60 units, it is generally considered that there are another 90 units in the country which are working at marginal or only slightly above marginal efficiencies. The closure of some of the units might no doubt be due to reasons other than those connected with prices or economies of operation, but at least in a large number of cases it is reported that their closure should be ascribed to their working at losses continuously for several years.

(iii) *Diminishing productivity.*—Another important problem of the industry is that of diminishing productivity. The necessity for rationalisation so as to step up productivity has been generally recognised and careful analysis of all the factors which might help to put the industry on a sounder basis is called for. Recently, the Ahmedabad Textile Industries Research Association (ATIRA) has also been taking a keen interest in studies relating to productivity, rationalisation, quality control, etc., and with their assistance it should be possible for the industry to place itself on a firmer footing.

(iv) *Replacement of plant and machinery.*—The Working Party for the Cotton Textile Industry appointed by the Central Government in March 1950 was asked to report *inter alia* on measures for reducing the cost of production of textile manufactures and for achieving rationalisation of the industry. The Technical Sub-Committee, appointed by the Working Party, made a sample survey of the plant and equipment and layout of factories, etc., which showed that the industry was working with plant and machinery most of which was not only old, but completely outmoded and that the renewal of the machinery was an urgent problem. According to the memorandum submitted to the Working Party by the Bombay Millowners Association, nearly 90 per cent. of the machinery in the Bombay mills was more than 25 years old. During the second world war, apart from over-working the machinery, proper maintenance was neglected owing to the difficulty in obtaining spare parts. The Technical Sub-Committee also pointed out that machinery obtained prior to 1910 which still existed in the mills was obsolete in design and completely worn out and should be replaced by modern equipment as soon as possible. Operation with such equipment would result in higher costs and poor quality of product, not to speak of the increased strain on the workers. After taking the findings of the Technical Sub-Committee into consideration, the Working Party recommended that high priority should be accorded to the rehabilitation of plant and equipment and to re-modelling some of the existing buildings of the industry. It further suggested that the process of rehabilitation and renovation would have to be spread over 10 to 15 years so as to avoid having to pay abnormal prices for plant and machinery and to regulate timely deliveries of the same. The Working Party also pointed out that the reserves available with the industry were not commensurate with the requirements of such a large task and that the Government should assist the industry by advancing loans at 4 per cent. interest. This suggestion of the Working Party is under consideration.

(v) *Co-ordination of yarn production and supplies to handloom industry.*—The last problem of the mill textile industry, and perhaps one of the most important, is the necessity of coordinating the activities of this section with that of the handloom section. There are provisions in the Textile Control Orders according to which even the composite mills could be compelled to supply free yarn to the extent they did in 1949-50 and also for securing 25 per cent. of the yarn output of all new units and extensions. But, so far, these provisions have not been applied. In the event of sufficient cotton being available to enable the mill industry to work to capacity and with the incentive provided by the restoration of the 4 per cent. cut, if the spinning units produce sufficient yarn from the cotton, it might not be necessary to have recourse to these measures. The problem of the future development of the industry discussed later is intimately related to the problems of the supply of yarn to the handloom section. A close and continuous coordination between yarn production and supplies to the handloom industry will be necessary in order to utilise the cotton in the best interests of the country.

III. Programme of Development

(a) *Existing programme.*—The Post-War Planning Committee, taking into consideration the low *per capita* consumption of cloth in the country and the necessity of stepping up the same in order to improve living standards, recommended the installation of 746,000 fine spindles and 1,686,000 coarse spindles in different parts of the country. These were in addition to the provision of 130,000 spindles for helping the expansion of some of the smaller units in the South Rajasthan Zone and 133,000 spindles for a similar purpose in

the Bombay State. The installation of 25,000 spindles in the State of Patiala was also recommended. As against this allotment, 621,470 spindles have been installed in the 50 new textile mills that had come into existence by 31st March 1952. It is interesting to note that most of the new mills have sprung up in Madras and Bengal and that their sizes are uneconomic in spite of the definite recommendations of the Post-War Planning Committee indicating suitable sizes and locations for such new units. The present economic situation of the country, the shortage of cotton, the paucity of capital and the high prices of capital goods and protracted deliveries have jointly contributed to the slow implementation of the Post-War Planning Committee's recommendations.

(b) *Recommendations*—(i) *Production programme and pattern of development.*—In suggesting the programme of production outlined below, account has been taken of the desirability of maintaining a high level of exports of cotton piecegoods during the period of the Plan in addition to increasing the availability of cloth in the domestic market. The exports target has been placed at about 1,000 million yards of piecegoods from 1952-53 onwards. *Per capita* consumption in the country is envisaged to increase to a minimum of 13 yards by 1952-53 and to reach 15·0 yards by 1955-56. Further, an important role is visualised for the handloom industry with the object of finding a solution for the problem of rural unemployment and under-employment which would be aggravated to a certain extent as a result of measures taken to achieve rationalisation of agriculture.

The programme of production of the mill industry should envisage the fuller utilisation of the rated capacity of the spinning section so as to produce 1,510 million lbs. of yarn in 1952-53 and 1,640 million lbs. of yarn in 1955-56. These targets of production can be achieved with the existing spindleage if fully utilised.

The weaving section of the mill industry which had an annual rated capacity of 4,744 million yards by March 1951 and would expand to 4,778 million yards capacity by 1955-56 by the implementation of the existing programme should aim at producing 4,600 million yards of piecegoods per annum during 1952-53 and 4,700 million yards by 1955-56. This production of the mills would be supplemented by the output of handlooms which should be progressively increased from the estimated output of 924 million yards in 1951-52 to 1,300 million yards by 1952-53 and 1,700 million yards by 1955-56. For achieving the output of 1,700 million yards, the handloom industry requires 380 million lbs. of yarn. It is presumed that with full utilisation of the spindleage in existence and under installation, the mills would be able to supply the requirements of handlooms apart from providing some quantity of yarn for powerlooms and other miscellaneous industries.

(ii) *Expansion of uneconomic units.*—The existence of nearly 150 inefficient and uneconomic units in the country has already been referred to. The necessity of modernising such units and/or of helping them to increase their capacities to economic sizes needs no emphasis. Facilities both in the form of foreign exchange and other types of assistance might become necessary to enable a large number of such units to function continuously and deliver goods corresponding to their capacities. Replacements for modernisation purposes and some expansions for conversion of uneconomic units to economic sizes have to be visualised in the interests of increasing the efficiency of the industry and its competitive strength. The constitution of an expert committee to make a detailed study of all such units for determining the programme of modernisation and alterations required is also necessary. Depending on the findings of this committee and its recommendations, necessary action would have to be taken by the mills, failing which

the Government will have to intervene and take specific measures for improving the production of such mills.

(iii) *Establishment of new units.*—In view of the recommendation to expand cloth production significantly in the handloom sector, it is not necessary to allow the establishment of new composite mills in the country during the period of the Plan. On the other hand, it might be necessary for the Government to allow the establishment of new spinning mills in spite of the fact that the spindleage in existence would be sufficient to produce the required quantity of yarn on fuller utilisation. The necessity for fostering industrial development in backward areas, the desirability of bringing into existence cooperative spinning mills with the object of enabling handloom weavers to achieve independence of external sources of yarn supplies, and the need to rehabilitate displaced persons provide the *raison d'être* for new spinning mills. Further, new small-scale spinning units like the Garabo and Tokubo units and Kale's spinning unit which have great potentialities for the development of small-scale industries in rural areas favourably situated in regard to cotton supplies, are expected to be established during the period of the Plan. However, these developments have to be conceived on a moderate scale considering the limitations that would be set by supplies of cotton. Taking all factors into consideration, it is our view that the installation of 350,000 spindles (apart from additions in existing mills for the expansion of units to economic size) during the period of the Plan would meet the requirements from all points of view. The capital investment on this expansion would be of the order of Rs. 800 to Rs. 900 lakhs.

(iv) *Export policy and quality control.*—Good markets for Indian textiles have been established in other countries and efforts should be made to retain them by increasing the competitive strength of the industry and by permitting only the export of goods of proper quality. An export quota of 1,000 million yards per annum should be provided for from 1952-53 onwards. It is necessary, however, to determine the quotas each year in advance immediately after the cotton supply position is known and after providing for the minimum *per capita* requirements in the domestic market.

(v) *Handloom industry.*—Organisation of the handloom workers on a proper cooperative basis for securing adequate supplies of raw materials and adequate off-take of the finished products should be ensured.

(vi) Sufficient supplies of yarn through cooperative societies on a credit basis should be arranged, so that the handloom worker is always provided with sufficient yarn.

(vii) The State Governments should employ expert designers, who would maintain a constant flow of designs which would be distinctive if manufactured on the handloom and which it is not possible for the mills to produce.

(viii) All exports of yarn, other than for meeting the commitments under trade agreements, should be banned and in the event of domestic yarn production being found inadequate due to cotton shortage, etc., the question of providing facilities for importing yarn, especially for meeting the requirements of the handloom industry, should be considered.

(ix) So long as the output of handloom cloth in the spheres already reserved is below normal and there is room for stepping up production of such types of cloth, there might be no necessary for reserving additional fields. But as soon as production in the reserved

fields exceeds demands and the industry is in a position to increase cloth production further, it may be necessary to extend the spheres reserved for handloom production.

(x) Full facilities should be created for undertaking investigation into the development of new types of hand-spinning and hand-weaving equipment, so as to improve the efficiency of handloom operations and to achieve a larger output per man.

(xi) Machinery should be set up to render technical advice to the handloom industry so as to secure greater output per loom.

(xii) Facilities should be provided for handloom industry to capture and maintain export markets to an increasing extent.

(xiii) In addition to encouragement to the weaving section of the handloom industry, the question of helping this section of the industry to undertake processing of textiles should also be given adequate consideration.

(xiv) As electric power becomes available to an increasing extent in rural areas with the development of hydro-electric and other power projects, the handloom industry should be encouraged to take advantage of power and gradually change over to small powerlooms. Encouragement should be given to the use of small power-operated spinning and weaving units on a wider scale so as to step up output per man and improve the economies of this section of the industry.

The following table summarises the programme of development of the cotton textile industry during the period of the Plan:—

	Unit	1950-51	1952-53	1955-56
Rated capacity of mill industry—				
Spindles	Numbers	10,942,241	11,175,283	11,292,241*
Yarn	Million lbs.	1,668·7	1,704·2	1,722·0
Looms	Numbers	194,411	195,84	195,849
Cloth	Million yds.	4,743·6	4,778·7	4,778·7
Actual production—				
Yarn	Million lbs.	1,179	1,510	1,640
Mill cloth	Million yds.	3,718	4,600	4,700
Handloom cloth	,,	8,10	1,300	1,700
Exports—				
Yarn	Million lbs.	74·5	..	..
Cloth	Million yds.	1,269·5	1,000	1,000
Requirements of raw cotton	Million bales	3·5	4·5	4·9

*This figure does not include additions in existing mills for achieving economic sizes.

APPENDIX I

Rated capacity of the cotton textile industry in various areas in India as on 1-4-1951

Zones	Number of Mills			Spindles in Spinning Mills	Spindles in Composite Mills	Total Spindles	Looms in Composite Mills
	Spinning	Composite	Total				
1	2	3	4	5	6	7	8
Ahmedabad City	4	63	67	54,844	1,868,324	1,923,168	42,041
Bombay City	5	58	63	77,544	2,895,424	2,972,968	64,895
Bombay Rest	11	38	49	161,476	1,082,048	1,243,524	23,580
Saurashtra	2	8	10	8,496	143,296	151,792	3,032
Kutch	1	..	1	5,312	..	5,312	..
Madhya Bharat	2	14	16	25,340	389,398	414,738	10,660
Bhopal	..	1	1	..	15,004	15,004	400
Ajmer	..	4	4	..	64,420	64,420	1,755
Rajasthan	2	5	7	20,016	72,722	92,738	1,544
PEPSU	..	1	1	..	17,856	17,856	390
Punjab	1	2	3	4,648	35,936	40,584	665
Delhi	..	3	3	..	140,976	140,976	3,435
Uttar Pradesh	5	16	21	56,328	678,092	734,420	12,636
Bihar	..	2	2	..	29,520	29,520	746
Bengal	3	15	18	62,308	324,530	386,838	7,486
Orissa	..	1	1	..	33,404	33,404	432
Madhya Pradesh	..	11	11	..	366,552	366,552	7,218
Hyderabad	..	6	6	..	116,762	116,762	2,559
Madras	59	18	77	1,204,449	658,108	1,862,557	7,566
Mysore	3	5	8	53,512	165,904	219,416	2,655
Kerala	5	4	9	80,688	29,004	109,692	716
TOTAL	103	275	378	1,814,961	9,127,280	10,942,241	194,411

NOTE.—Two separate units of the same undertaking but working in the same premises and under the same management are regarded as one unit for the purposes of cols. 2 to 4 of this table. The number of such cases is 8.

APPENDIX II

Requirements of raw materials for maintaining production based on 4·2 million bales of cotton

Material	Quantity	Value (Rs. lakhs)
Card clothing	3,500 Sets	47
Bobbins	425,000 Gross	1,20
Shuttles	8,300 „	60
Healds	800,000 Sets	45
Reads	400,000 Pcs.	18
Pickers	37,500 Gross	12
Mutton tallow	3,600 Tons	62
Starches	36,000 „	90
Coal tar dyes	5,900 „	10,00
Hydrosulphite of soda	2,000 „	45
Zinc chloride	3,000 „	22
Caustic soda	15,000 „	1,07

34. JUTE

Jute and jute products, though used primarily as packing materials, have come to assume great significance in international trade by virtue of their indispensability to the world at large under modern conditions of commerce. Due to the strength, hard wearing qualities and relative cheapness of the fibre, jute manufactures continue to hold a unique position in the world market despite many attempts to popularise substitutes like cloth and paper bags, etc. The heavy capital investment in the industry as well as its position as a valuable exchange earner gives it a very important position in this country.

The industry has grown rapidly as may be seen from the table below:—

Growth of Jute Industry

	(Number of looms)*
1885	6,700
1900	15,335
1910	31,755
1920	40,477
1930	58,639
1940	65,386
1950 (as on 30th June 1951)	65,720

These figures include only hessian and sacking looms. Figures for other looms are not available for previous years.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—In 1950, there were 112 registered jute mills in the country with a total number of 72,161 looms. Of these mills, 101 were located in West Bengal whereas the rest were dispersed in the states of Madras, Bihar, Uttar Pradesh and Madhya Pradesh. The actual loomage as on 30th June 1951 including all factories has been estimated as 72,235, consisting of 68,608 looms for hessian and sacking and 3,627 other looms. The total capacity of the mills has been estimated to be 100,000 tons per month (on the basis of a single shift and a 48-hour week). Actual production (July-June) has been considerably below capacity in recent years, approximately 1,081,000 tons in 1948-49, 858,000 tons in 1949-50, 892,000 tons in 1950-51, and 980,000 tons in 1951-52, as compared to the production level of 1,140,200 tons in 1945-46. In 1950, the value of the products manufactured came to about Rs. 150·0 crores.

(b) *Capital and labour.*—While information about the capital invested in the industry is not fully available, it is known that 107 mills out of the total had a total fixed capital of Rs. 29·81 crores and a working capital of Rs. 37·4 crores in 1950.† During the same year, the total average labour strength of these mills was, 306,000. Immediately after partition, the jute industry faced an acute shortage of skilled labour because a very large percentage of skilled workers migrated to Pakistan. However, this problem has been more or less solved now and the present labour force can be said to have reached a satisfactory level of skill and efficiency.

(c) *Raw materials.*—Raw jute, which is the most important raw material, is the fibre extracted from jute plants by retting them in water. There are two varieties‡, the fibre from

* Looms belonging to Members of the Indian Jute Mills Association only.
† *Source :* Monthly Statistics of Production of Selected Industries of India, January 1952.
‡ Corchorus capsularis and corchorus olitorius.

one being known as 'white jute' and the other as 'red jute' (tossa jute). The latter fibre, being finer, softer and stronger is considered superior. For normal operations, aiming at a production equivalent to the rated capacity, the industry requires about 7·0 million bales of raw jute. Before partition, there was no problem of shortage of raw jute as production of raw jute used to be sufficient to meet the demands of the industry and for exports.

Of the raw jute-producing area, only about 25 per cent. remained in Indian territory after partition. Even of the jute produced in this area, only about 25 per cent. was really of sufficiently good quality to be used by the industry, though in practice the proportion of Indian jute used since partition has been higher. It has been estimated that out of the total requirements of the industry, which are of the order of 7·0 million bales, internal supplies in 1950-51 were of the order of 3·1 million bales out of the total crop of 3·3 million bales, the remaining 150,000 to 200,000 bales having been required for miscellaneous uses. For the balance the industry was dependent on imports, mainly from Pakistan.

Immediately following partition, it became clear that the industry was going to pass through a period of serious difficulties. The devaluation of the Indian rupee in September 1949, together with non-devaluation by Pakistan upset the exchange parity and led to a breakdown of normal trade relations between the two countries. This created a major crisis for the industry. At almost the same time, the Government of Pakistan fixed minimum prices and purchased part of the crop to maintain the prices in Pakistan.

In order to meet the situation, the following three courses of action were resorted to:—

(i) The Central Government fixed maximum prices for raw jute in consultation with the Indian Jute Mills Association and steps were also taken to ration the available supplies to various mills. At the same time severe restrictions were imposed on exports of raw jute.

(ii) Steps were also taken to expand the internal production of raw jute through reclamation of waste land, diversion of some areas to jute from the *aus* paddy, double cropping of *aman* lands, use of fertilisers and adoption of plant protection measures. The degree of success achieved may be seen from the following figures:—

Expansion of jute cultivation in the Indian Union

	Area under jute ('000 acres)	Production of raw jute ('000 bales)
1947-48	652	1,658
1948-49	834	2,055
1949-50	1,163	3,089
1950-51	1,454	3,301
1951-52 (Final forecast)	1,951	4,678

(iii) Attempts were made to secure part of the requirements from Pakistan through negotiations at governmental level. The agreements with Pakistan provided for imports of 5 million bales of raw jute in 1948, 4 million bales in 1949, 800,000 bales in 1950 and 3·5 million bales in 1951 (February 1951 to 30th June 1952). While accurate figures are not available, it has been estimated that imports have been roughly as given in table on next page.

Imports of raw jute from Pakistan

	('000 bales)* By sea	By land
1948-49	45	3,904
1949-50	1	1,659
1950-51	6	2,490
1951-52 (July-May)	..	1,726

Other raw materials.—Apart from raw jute, the industry requires a wide range of products as raw materials. The most important of these are cotton selvedge yarn, batching oil, batching oil emulsifier, bobbins and shuttles. The quantities and values of these consumed by the industry in 1949 are given below:—

	Quantity	Value (Rs. '000)
Cotton selvedge yarn	1,018 tons	40,90
Batching oil	138,67 ('000 gals.)	1,27,40
Batching oil emulsifier	532 „	15,40
Bobbins	55,646 (gross)	60,20
Shuttles	702 „	6,70

In recent years, there has been considerable improvement in both the quality and availability of indigenous mill stores. However, it will be necessary for the mill stores manufacturers to take immediate steps to ensure further improvement, particularly regarding quality.

(d) *Imports and exports.*—The imports of jute manufactures, mostly second-hand bags from Ceylon, are of very minor importance (the value being Rs. 5 to 10 lakhs per annum in 1947-51) compared to total internal production and exports. Exports of raw jute, on the other hand, used to be considerable but, due to shortage of raw jute and other factors, have now been severely reduced as under:—

Exports of raw jute and jute goods

	1948-49		1949-50		1950-51		1951-52	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Raw jute ('000 bales and Rs. crores).	1,193	23·95	830	16·74	·02	·06	..	..
Jute manufactures, including twist and yarn ('000 tons and Rs. crores).	929	1,47	787	1,27	650	1,14	809	2,70

The decrease in the quantity of jute manufactures exported in 1949-50 and 1950-51 has been mainly due to the decrease in production due to shortage of raw jute. More recently exports have been facing slackness of demand for manufactured goods in foreign countries. It is proposed that, with the easing of the raw jute position due to increased indigenous production, a vigorous export drive, assisted by the recent reduction in the level of export duties, should be undertaken so as to increase exports from 825,000 tons in 1952-53 to about 1 million tons by 1955-56.

* Pakistan Government figures of imports into India

(e) *Estimated demand and export targets.*—In recent years, jute bags have been facing increasing competition from substitutes like cloth and paper bags. Moreover, certain commodities which used to be formerly packed in jute bags are now being bulk handled, particularly in the United States of America. As a result, in recent years, two of the main markets for Indian jute goods, the United States of America and Argentina, have been showing a tendency to absorb less and less Indian jute manufactures, though this tendency has been held in check to a considerable extent by the rearmament programme of the United States of America and the consequent stockpiling drive. In general, it can be said that the popularity of jute goods as packing materials has continued undiminished, though the price of jute bags was, until the recent recession, slightly higher than that of cloth bags and very much higher than that of paper bags. The main reason has been that jute bags have the advantage that they can be used many times over. Provided adequate propaganda is undertaken, there is no reason why the present popularity of jute products should not continue. Assuming a vigorous export policy, it has been estimated that it would not be difficult to achieve the target of 1 million tons by 1955-56, as against the export of 929,000 tons in 1948-49, 650,000 tons in 1950-51 and 809,000 tons in 1951-52. During the same period domestic requirements have been estimated to reach 175,000 tons by 1952-53 and 200,000 tons by 1955-56.

II. Problems of the Industry

The main problems facing the industry are shortage of raw materials, modernisation of equipment and possible competition in the foreign markets from substitutes and from other products—

(i) *Raw material shortage.*—It has already been mentioned that the main raw material, raw jute, is in short supply. The future requirements of raw jute for the proposed targets of production of jute manufactures are estimated at 5·8 million bales in 1952-53 and 7·0 million bales in 1955-56. Raw jute available for the jute industry from domestic sources is expected to increase to 4·7 million bales in 1952-53 and 5·1 million bales in 1955-56 and *Bimli** and *Mesta** would supplement the jute supply at the rate of 600,000 tons and 1·0 million tons in 1952-53 and 1955-56 respectively. The balance of raw jute requirements would be obtained from outside sources. However, in order to achieve a satisfactory level of self-sufficiency in raw jute, it will be necessary to improve the quality of the indigenous raw jute besides increasing the quantity produced internally.

(ii) *Modernisation of plant and equipment.*—In most of the continental countries rapid re-equipment of the jute industry has been taking place in the post-war period. A number of countries like Pakistan, South Africa, Brazil, the Philippines and Japan have started building up a jute manufacturing industry with completely modern equipment. These countries are already beginning to enter the foreign markets with jute goods produced at a considerably lower cost than Indian goods. Unless the plant and equipment in this country are also modernised so as to attain a level of competitive efficiency it may become very difficult to maintain foreign markets. Since the Indian industry is dependent primarily on foreign markets, the task of modernising the equipment of the Indian industry cannot be delayed longer.

* Is a substitute fibre which can be mixed with raw jute.

There is little doubt that the latest equipment used in other countries like the high speed automatic doffing sliver spinning frame, combined jute spreader and softener, combined breaker finisher card with roll formers and a machine for winding yarn into cops and on to spools has had the effect of further economising labour and space and of increasing operating efficiency. The efficiency of the sliver spindle is said to be about double that of the ordinary spindle. Similarly, the circular loom is said to have revolutionised the technique of weaving. The main advantages of the loom are said to be the operating speed and the fact that cloth comes out in a cylindrical shape, requiring only to be cut at one end and sewn to convert it into a bag. Lack of the necessary finance is stated to be a major factor deterring the industry from undertaking modernisation. Certain mills have, however, already taken steps in this direction. It is estimated that modernisation would have to extend over a period of 10 to 15 years and would require finance to the extent of Rs. 40 to 45 crores. It is necessary for the industry to work out a scheme for a solution of this problem over a period of years. Governmental assistance may be necessary to plan out a smooth and gradual process of retrenchment and re-employment of labour which may be rendered surplus through the introduction of new labour-saving machinery. It has been estimated that about 40,000 hands may be rendered surplus in the industry as a whole as a result of its complete modernisation.

The near-monopolistic position held so long by the Indian jute industry in world markets is beginning to be challenged very seriously and early steps will have to be taken to maintain the position in export markets. The sales organisation for jute goods, which has been rather weak so far, should be developed along sound lines.

III. Programme of Development

(a) *Existing programme.*—In view of the shortage of raw materials and the existence of unused capacity in mills at present, there are no plans either for the establishment of new mills or for expanding existing mills. The immediate objective is to utilise more fully the available capacity by procuring greater supplies of raw jute and thus increase production to 1·0 million tons per annum by 1952-53 and 1·2 million tons by 1955-56.

(b) *Recommendations.*—(i) In order to utilise the existing manufacturing capacity of the mills as fully as possible, it is absolutely necessary to increase the supplies of raw jute. The long-term objective should be to make the industry as independment of imports as possible through increasing indigenous production of raw jute as well as by improving the quality of raw jute produced in the country. To improve the quality of raw jute, it will be necessary to undertake a long-term programme of propaganda and education among the cultivators as well as to supply them with improved seeds, etc. However, as an interim measure steps should be taken to ensure regular imports of raw jute from Pakistan through negotiations and trade agreements.

(ii) Encouragement has to be given to the manufacture of mill stores in the country, particularly good quality bobbins and pickers. The formulation and enforcement of standard specifications may go a long way towards overcoming the prejudice against mill stores manufactured within the country.

(iii) The industry should take steps to popularise Indian jute products in foreign markets through proper publicity measures.

(iv) In order to maintain the export markets, which are vital to the existence of the industry, it will be necessary to review the export duty on jute manufactures at regular

intervals and adjust it in accordance with price trends in India and the demand from foreign markets. The export duties were reviewed twice during recent months and brought down from Rs. 1,500 per ton on hessian and Rs. 350 per ton on sacking to Rs. 275 per ton and Rs. 175 per ton respectively. It is hoped that the industry will take full advantage of the relief thus given and will make all-out efforts to fulfil the export targets envisaged.

The following table summarises the programme of development of the jute industry during the period of the Plan:—

	1950-51	1952-53	1955-56
Annual rated capacity ('000 tons)	1,200	1,200	1,200
Actual production ('000 tons)	892	1,000	1,200
Exports ('000 tons)	650	825	1,000

35. RAYON

Rayon is one of the four fibres—cotton, wool, silk and rayon—on which the population of the world has come to depend increasingly for its clothing requirements. It is a synthetic fibre whose development dates from the beginning of the 20th century. The remarkable progress made by the rayon industry during the last 50 years is attested by the expansion of its production from a paltry figure of 2 million lbs. in 1900 to 2,704 million lbs. in 1949. The increase in the production of cotton fibre during this period was 7,220 million lbs.

Rayon is produced as a continuous filament or as a cut yarn, and uniform lengths of from 2 to 6 inches are known as staple fibre. The latter when twisted into yarn is known as spun rayon and has a soft woolly feel.

Staple fibre can replace long staple cotton which is in short supply in the country and the cultivation of which cannot be undertaken on an extensive scale on account of the need for utilising more land for the production of food crops. Its manufacture is admittedly of great importance to the national economy from this aspect, and has to be accorded its due place in any long-range plan for tackling the problem of the domestic shortage of textile fibres.

It is estimated that in 1951 there were 25,980 mill looms in 476 mills and 181,278 handlooms engaged in the manufacture of art silk fabrics and giving employment to a large number of workers and artisans. The handlooms also work on the production of pure silk fabrics. The requirements of the rayon weaving industry are estimated at 70 to 75 million lbs. of filament yarn which till recently had to be entirely imported. The development of an indigenous rayon industry would obviate the dependence of the indigenous artificial silk weaving industry on foreign countries.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—Though rayon had been consumed in substantial quantities for the manufacture of art silk fabrics, particularly during and after the second world war, efforts to manufacture it in this country started only in the post-war period. There are at the present time two plants in operation, *viz.*, Travancore Rayons Ltd., Perambavoor (annual production capacity 4·0 million lbs. of filament yarn) and the National Rayon Corporation Ltd., Kalyan, Bombay (annual production capacity 5·6 million lbs. of filament yarn). The former came into production in July 1950 and the latter in February 1951. Both these factories have adopted the viscose process.

There is a third plant belonging to Sirsilk Ltd., under construction at Sirpur (Kaghazangar), Hyderabad State with a daily production capacity of 5 tons based on the cellulose acetate process. Unlike the other two plants, it is being equipped to produce and utilise the cellulose acetate filament within the factory itself for producing artificial silk fabrics at the rate of 50,000 yards per day. The plant is expected to go into production in 1953. A fourth factory has been planned for the production of 15 tons of viscose staple fibre per day at Nagda in Madhya Bharat by the Gwalior Rayon Silk Manufacturing (Weaving) Company Ltd. Work on its construction has started and it is expected to go into production in 1953.

All the above factories have been planned on the basis of foreign technical advice and the units operating the viscose process produce also carbon disulphide and sulphuric

acid in the factory with the exception of Travancore Rayons Ltd. who purchase the latter from FACT Ltd. Sirsilk Ltd. has facilities for the production of acetic acid, acetic anhydride and acetone to meet its requirements. The acetic acid plant has a daily rated capacity of 9 tons per day and the acetone plant of 2 tons per day.

The annual rated capacity of the rayon industry, based on a continuous operation for 360 working days per annum, is summarised in the table below: —

	Filament yarn (million lbs.)	Staple fibre (bales)	Art silk cloth (million yards)
1. Travancore Rayons Ltd., Alwaye	4·0	..	..
2. National Rayon Corporation Ltd., Kalyan, Bombay	5·6	..	..
3. * Sirsilk Ltd., Kaghazangar, Hyderabad	4·00	..	18·0
4. Gwalior Rayon Silk Manufacturing (Weaving) Company Ltd., Nagda	..	†28,000	..

According to information supplied by the Development Wing of the Ministry of Commerce and Industry, the actual production of the two factories in operation was as follows: —

	(Million lbs.)
1950	0·27
1951	4·5
1952 (Jan-June)	3·2

The gap between actual production and rated capacity is due to shortage of raw materials and the infant nature of the industry.

(b) *Capital and labour*.—The capital employed in the two firms already in production in March 1951 was Rs. 7·1 crores, while the labour employed was 1,400.

(c) *Raw materials*.—The principal raw materials for the viscose process of rayon manufacture are pulp, caustic soda, carbon disulphide and sulphuric acid. The requirements of the raw materials for production of viscose rayon and staple fibre when the three viscose-rayon plants operate to their full capacity, *i.e.*, 12·5 tons per day of filament rayon and 28 thousand bales per annum of staple fibre are: —

	Tons	Source
Pulp	11,500	Imported
Caustic Soda	9,500	,,
Carbon disulphide	3,250	Indigenous
Sulphuric acid	12,700	,,

Sulphur for the manufacture of carbon disulphide and sulphuric acid has to be imported.

The cellulose acetate plant of Sirsilk Ltd., with its rated capacity of 5 tons per day is estimated to require the following quantities of raw materials per annum: —

	Tons	Source
Cotton linters or a suitable alternative such as wood pulp or short staple cotton	1,500	Imported
Acetic acid	1,750	Indigenous
Acetone	630	,,
Sulphuric acid	200	,,

From the beginning of 1954, it is envisaged that this plant would be able to dispense with imported linters and take to cotton linters and/or cotton waste equivalent to 2·87 million lbs. made available from domestic sources.

* Under construction
† This will be used up in production of fabrics and will not be available for sale as yarn.

(d) *Imports and exports.*—The imports consist of staple fibre, rayon yarn, yarn of rayon staple fibre, and rayon piecegoods and were as follows in the post-war period:—

(Quantity in million lbs. and value in lakhs of rupees)

Year	Yarn		Piecegoods		Staple fibre (cut fibre & waste)		Yarn made of staple fibre		Total including other goods mixed
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Value
1948-49	39·9	12,83	4·0	103·6	0·05	0·66	0·75	20·0	1412·6
1949-50	36·9	10,46	14·3	314·8	0·45	6·5	2·76	77·6	1548·9
1950-51	35·3	14,71	1·8	41·7	12·6	189·9	1·25	30·9	1739·4
1951-52	36·5	17,29	3·0	82·4	36·5	1010·1	3·73	117·0	2953·8

The United Kingdom, Italy, Japan and the U. S. A. were the principal sources of supply and imports of staple fibre registered a remarkable increase in 1950-51 and 1951-52. These increased imports were probably designed to relieve the shortage of long staple cotton.

The producers of rayon piecegoods pointed out to the Indian Tariff Board in its enquiry into the continuance of protection to the Artificial Silk and Cotton and Artificial Silk Mixed Fabrics Industry in 1951 that the following factors were creating difficulties in regard to artificial silk yarn imports:—

(i) Stockpiling of artificial silk yarn by several foreign countries after the commencement of the Korean War, as a result of which producers of yarn abroad are not able to supply the requirements of the indigenous artificial silk industry.

(ii) Inadequate import quotas fixed by the Government for this material in connection with their import control policy.

(iii) Considerable delay in the grant of import licences as a result of which looms had to remain idle for want of yarn supplies.

(iv) Speculation by producers of yarn abroad and by importers. It is stated that the limited imports allowed by the Government at different periods are taken advantage of by the producers abroad, who have formed a cartel, and by the importers in this country to raise prices according to the quantity of yarn licensed for imports.

There have been some exports of artificial silk piecegoods principally to Pakistan, Ceylon and Anglo-Egyptian Sudan.

Sea-borne exports of artificial silk piecegoods from India

	Million yards	Lakhs of Rs.
1948-49	24·50	519·1
1949-50	12·23	148·7
1950-51	6·99	95·8
1951-52	8·41	117·0

(e) *Estimated consumption and requirements.*—The demand for rayon yarn, filament or spun, is influenced by (1) the facilities available for weaving it into art silk fabrics and (2) the targets prescribed for indigenous consumption, exports and imports of art silk piecegoods.

(1) *Facilities for weaving.*—The Report of the Indian Tariff Board on the continuance of protection to the Artificial Silk and Cotton and Artificial Mixed Fabrics Industry (1951) estimated the number of powerlooms and handlooms in existence exclusively engaged in art silk weaving at 25,801 and 75,000 respectively. Assuming the operation of powerlooms on double shift and of handlooms on single shift, and that 5 handlooms are equivalent to 1 powerloom in regard to yarn requirements, the existing productive capacity for weaving art silk fabrics has been estimated at 350·0 million yards per annum by the Board. The requirements of art silk yarn for achieving production equivalent to the capacity would be about 70 to 75 million lbs. The weaving capacity of powerlooms would increase by another 15·0 million yards with the completion of the plant belonging to Sirsilk Ltd.

(2) *Actual consumption of rayon piecegoods and targets of future requirements.*—The demand for rayon fabrics is predominantly from the urban population and, but for the restricted supplies available, its consumption should have increased considerably as a consequence of the drift of the rural population into urban areas and of changes in the tastes of people. As a cheap substitute for silk, it has also great potentialities, and its use in mixed cotton and wool fabrics is bound to increase in future years.

As regards consumption in the past, the triennial averages of consumption of artificial silk goods, exclusive of socks and stockings and mixed fabrics, in 1937-38/1939-40 and 1948-49/1950-51 were as under:—

Supply	Annual average of 1937-38/ 1939-40 (million yards)	Annual average of 1948-49/ 1950-51 (million yards)
Filament imports in terms of fabric	131·5	188·5
Staple fibre and yarn imports in terms of fabric	23·8	27·3
Imported piecegoods	57·5	6·7
Total	212·8	222·5
Export	..	14·6
Indigenous consumption	212·8	207·9

(1 lb. of yarn=5 yards of cloth : 1 lb. of staple=4·5 yards of cloth.)

The above figures indicate that the consumption has remained practically unchanged and that there has been an increase in the imports of filament yarn at the expense of finished piecegoods, which means that the weaving industry has begun to consume more art silk yarn during the last decade. The supplies of yarn still fall short of the production capacity of the rayon weaving industry assessed at 350·0 million yards per annum.

Future requirements of artificial silk piecegoods have to be adjusted according to availability of foreign exchange for importing filament yarn and staple fibre as well as the supply of those materials from the indigenous factories in operation and under construction. This basis of pegging future demand at a certain level is also justified by the fact that rayon piecegoods can claim to be considered as consumer goods of significance to only a small proportion of the population. The requirements for internal consumption in future years have, therefore, been fixed at 220 million yards in 1952-53 and at 240 million yards in 1955-56. These requirements do not, however, include provision for exports of 5·0 million yards and 10·0 million yards respectively in the corresponding years. If there is a fall

in prices, the possibility of enabling a further utilisation of existing productive capacity for fabrics might be considered.

The demand for rayon filament is linked with the production targets for rayon piecegoods corresponding to about 225 million yards in 1952-53 and 250·0 million yards in 1955-56 including requirements for export. The estimated future requirements of rayon filament on the above basis are:—

	1952-53 (million lbs.)	1955-56 (million lbs.)
Weaving industry	45·0	50·0
Miscellaneous industries (knitting, hosiery, gas mantles, embroideries, imitation jari)	5·0	5·0
Total	50·0	55·0

As regards staple fibre, the demand would depend upon its price and that of long staple cotton for which it is a substitute. In the circumstances, the requirements are difficult to predict and should be determined in relation to cotton supplies. Provision has been made for a consumption of 10·4 million lbs. in 1952-53 and 14·2 million lbs. in 1955-56, so that additional piecegoods equivalent to about 50·0 million yards and 70·0 million yards respectively would be available from this source.

II. Problems of the Industry

The rayon filament industry, as it has developed at present, is predominantly based on imported raw materials. The most essential raw materials for which the industry is dependent on imports are dissolving pulp, cotton linters, rayon-grade caustic soda and sulphur. While it may be difficult to attain any degree of self-sufficiency with respect to sulphur requirements, plentiful materials are available in the country to produce all the pulp, linters and caustic soda the industry needs. An effort has, therefore, to be made to strengthen the rayon industry by establishing a plant for the manufacture of pulp and a few units for the production of cotton linters. Recommendations to this effect are made elsewhere. As for rayon-grade caustic soda, the mercury cell plant that is under erection at Alwaye will be able to meet the demand for this grade of caustic soda at least partially.

III. Programme of Development

(a) *Existing programme.*—The attention of the Travancore Rayons and the National Rayon Corporation is currently concentrated on achieving full production though provision of building space has been made at both the places for possible expansion. The National Rayon Corporation contemplate expansion of their plant so as to increase the capacity to 7·0 million lbs. per annum by the end of 1953 and to 14·0 million lbs. per annum by 1955-56. The capital investment on these two stages of expansion has been estimated at Rs. 50 lakhs and Rs. 500 lakhs respectively. The expansions would provide additional employment to about 650 persons ultimately. As a result of the coming into operation of all the four rayon factories and the expansion project of the National Rayon Corporation, the rated capacity of the rayon filament industry would reach 22·0 million lbs., out of which 4·0 million lbs. would be consumed by the Sirsilk Ltd. within the factory in weaving rayon fabric so that 18·0 million lbs. would be available for the rayon fabric industry from indigenous sources. In addition, rayon staple equivalent to 11·2 million lbs. would also be available from within the country for the spinning and weaving industry. The total additional capital expenditure for achieving all the above developments has been estimated at about Rs. 10·5 crores.

On the basis of the expansion schemes mentioned above, the production of filament rayon and staple fibre from the primary producers is expected to be phased on the following lines:—

	Production target (Filament rayon in million lbs.) 1952-53	1955-56
National Rayons	5·6	14·0
Travancore Rayons	4·0	4·0
SIRSILK Ltd.*	..	4·0
TOTAL	9·6	22·0
	Staple Fibre in thousand bales	
Gwalior Rayon and Silk Manufacturing (Weaving) Co.	..	28·0

The fulfilment of the production programme envisaged above should be given the first priority by facilitating the completion of units under construction and the expansion project envisaged as well as by the importation of the necessary quantities of raw materials.

(b) *Recommendations*—(1) *Long-term plans.*—As indicated already, the textile industry is not in a position to obtain its requirements of long staple cotton without having recourse to heavy imports from foreign countries. The Five-Year Plan for the textile industry depends for its implementation on imports of about 1·2 million bales of long staple cotton despite internal supplies of cotton being augmented by about 1·2 million bales by 1955-56. The possibilities of further considerable extension of cotton cultivation are limited by the imperative need for narrowing the gap between demand for and available supplies of foodgrains. In this context and in view of the fact that capital investment on the rayon industry would begin to yield returns in a relatively short period, the production of artificial staple fibre which can supplement long staple cotton has great significance for the economy of the country. In view of the capital-intensive character of the industry, it is not found possible to recommend further expansion beyond what has at present been contemplated by the four factories mentioned above; but a forward programme designed to replace long staple cotton requirements to the extent of 250,000 bales of cotton should be kept as a long range target to be implemented immediately after 1955-56 as soon as conditions become favourable. This programme should be synchronised with (i) the development of the heavy chemical industry, particularly the sectors covering the manufacture of sulphuric acid and caustic soda (rayon grade) and (ii) the manufacture of rayon pulp and cotton linters.

In the absence of coordinated development in these two fields, the rayon industry would have to continue to depend on foreign raw materials on account of which the benefits, if any, would be meagre and doubtful.

(2) *Plans for cellulosic raw material industries.*—Instead of allowing additional finance to be diverted into further development of the rayon and staple fibre industry during the period of the Plan, efforts should be made to reduce dependence on imports of cellulosic raw materials, *viz.*, chemical pulp and cotton linters, along the following lines.

*Further processing into piecegoods is envisaged to be carried out within the factory.

(i) *Establishment of a chemical pulp plant.*—It has recently been estimated that the following quantities of fir logs would be available annually from the Himalayan region for the establishment of a newsprint plant:—

Punjab	35,000 tons
Himachal Pradesh	30,000 „
Tehri (U.P.)	110,000 „
Chakrata (U. P.)	5,000 „

It should be possible to utilise these soft timber resources for producing 100 tons of pulp per day comprising 50 tons of mechanical pulp and 50 tons of chemical pulp, 15 tons of which might be used in admixture with the entire quantity of mechanical pulp for producing newsprint. The balance of 35 tons per day of chemical pulp might be made available to the rayon factories. On this basis, and assuming 330 working days per annum, the dependence on imports of rayon-grade pulp could be reduced by 11,500 tons, representing a saving of foreign exchange equivalent to Rs. 2·3 crores per annum on the basis of a pulp price of Rs. 2,000 per ton. The project would simultaneously help to produce about 20,000 tons of newsprint.

This project might be taken up in the second part of the period of the Plan (1953-56) and a committee of experts should be appointed immediately to work out its technical and other aspects. The capital requirements, roughly estimated at Rs. 6·0 crores, might be financed jointly by the rayon and paper industries and if such collaboration is forthcoming, the Government should accord all reasonable encouragement for this project.

(ii) *Production of cotton linters.*—Cotton linters constitute a potential source of cellulosic raw material for the rayon industry in this country. These are present in the form of short fibres clinging to the cotton seeds coming out of the gins and may be estimated at 4 per cent. of the weight of seeds in the case of seeds from long staple cotton. Calculating possible supplies only from American varieties of raw cotton grown in the country, the resources have been estimated as follows:—

State	Supplies of linter as 4 per cent. seed (million lbs.)	Chemically pure cotton (assuming 80 per cent. conversion) (million lbs.)
Punjab	0·8	0·64
Madhya Bharat and Central India	0·6	0·48
Madhya Pradesh and Berar	0·9	0·72
Bombay	0·5	0·40
Hyderabad	0·1	0·08
Madras	5·5	4·40
TOTAL .	8·4	6·72

In addition, there are reported to be about 1·85 million bales of other varieties of cotton seed capable of giving about 59·0 million lbs. of linters on the basis of a lower (2 per cent.) yield on the weight of the seed.

The cotton linters industry should be integrated with the production of cotton seed oil and a few plants might be established in suitable locations in Madras, Hyderabad and Madhya Pradesh, etc., for producing at least a total of 5·0 million lbs. of cotton linters. This would yield simultaneously about 50,000 tons of cotton seed from which 7,500 tons

of cotton seed oil and about 40,000 tons of cake would be obtained. The value of the various products would be as follows:—

	(Rs. lakhs)
Cotton linters (4 annas per lb.)	12·5
Cotton seed oil (Rs. 2,000 per ton)	150·0
Cotton seed cake (Rs. 100 per ton)	40·0
TOTAL	202·5

The capital investment on plants required for achieving the suggested production of cotton linters, oil and cake is estimated at Rs. 60 lakhs. Before actual investment is made, the possible location of plants has to be carefully examined, having regard to the present distribution of cotton gins in these States. Other aspects of cotton seed crushing have been discussed in the Plan for the vegetable oils industry.

It is estimated that cotton linters adequate for meeting the requirements of Sirsilk Ltd., *i.e.*, 1,500 tons, would become available in the second part of the period of the Plan obviating the necessity of importing cotton linters. The effect of the developments recommended above and the production programme on the imports of artificial silk, staple filament and piecegoods and industrial raw materials are explained below.

The development programme brings about a reduction in the imports of staple fibre and filament yarn corresponding to about Rs. 5·0 crores in 1952-53 and Rs. 12·1 crores in 1955-56 on the basis of 1950-51 c.i.f. prices. This reduction would be offset by the necessity to import the raw materials of the rayon industry (caustic soda, sulphur, pulp, etc.), valued at Rs. 1·30 crores in 1952-53 and Rs. 3·78 crores by 1955-56. Exports of rayon piecegoods would earn foreign exchange equivalent to Rs. 68·0 lakhs in 1952-53 and Rs. 136·0 lakhs in 1955-56.

(3) In view of the fact that the existing capacity of the rayon weaving industry is sufficient to manufacture enough rayon piecegoods for consumption and export, it is not considered necessary to establish any additional weaving capacity.

The following table summarises the development programme of the rayon industry during the period of the Plan:—

	1950-51	1952-53	1955-56
Number of units—			
(i) Rayon filament and staple fibre	1	2	4
(ii) Chemical pulp	..	..	1
(iii) Cotton linters	..	..	3
Annual rated capacity—			
(i) Rayon filament and staple fibre (million lbs.)	4·0	9·6	22·0 (*plus* 28,000 bales)
(ii) Chemical pulp* (tons)	..	..	11,500
(iii) Cotton linters (million lbs.)	..	..	5·0
Actual production—			
(i) Rayon filament and staple fibre (million lbs.)	0·4	9·6	22·0 (*plus* 28,000 bales)
(ii) Chemical pulp (tons)	..	..	..
(iii) Cotton linters (million lbs.)	..	..	5·0

*It is not visualised that the pulp plant would make available any significant quantity of raw material during 1955-56

36. WOOLLEN MANUFACTURES

The woollen manufactures of India enjoyed a world-wide reputation before the advent of the mechanised industry. Even subsequently, certain special products of the industry such as woollen carpets have been in considerable demand in different countries and constitute an important item of the export trade.

The beginning of the Indian woollen industry on an organised large scale goes back to 1876 when woollen mills were installed at Kanpur and Dhariwal. Major expansions in woollen manufacture took place in 1919-20 and 1948-50. The *per capita* consumption of woollen goods is, however, still low in comparison with other countries due to the low standard of living of the people and the absence of severe cold in many parts of the country; and there is considerable scope for the expansion of the industry by utilising indigenous wool, the greater part of which is being exported at present, provided there is an increase in the purchasing power of the people. This is a long-range problem. The present plan provides for a modest measure of development which is described below and deals with the woollen textile industry, excluding carpet and other cottage type of industries.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—Woollen production is divided into two sections, *viz.*, woollen and worsted, based on the raw materials and the manufacturing process employed. In the worsted section of the industry, superior types of wool and other fibres are put through a series of processes of which the main intermediate products are tops and yarn, whereas in the woollen section a wide range of materials, chiefly raw wool as also fibres recovered from rags, are spun into yarn without the manufacture of any products corresponding to tops. Worsted yarn is woven into finer woollen fabrics such as serges, tropical suitings, shawls and knitted goods, while woollen yarn is used for the manufacture of blankets, meltons, blaser cloth, etc.

In 1951, there were 44 factories, including four put up since the war, two of which were then still under construction but have recently gone into production. The number of powerlooms and spindles installed at present are 2,039 and 116,800 respectively. The regional distribution of the woollen industry is as under:—

Regional distribution of the woollen mills industry (1951)

Region	Number of units			Annual rated capacity (a) (million lbs.)	Actual production (million lbs.)	
	Spinning only	Spinning and weaving	Total		1950	1951
Bombay	2	6	8	6·04	5·65	5·80
Saurashtra	..	1	1	1·50	*Nil*	*N.A.*
Punjab	..	26*	26	5·70	6·10	5·60
Uttar Pradesh	..	4	4	3·90	3·60	2·90
West Bengal	..	1	1	0·30	0·98	0·90
Kashmir	..	1	1	0·61	0·08	0·20
Mysore	..	3	3	2·10	2·05	2·30
TOTAL	..	..	44	20·15	18·46	17·7

* Of these, 22 units are mostly for weaving and account for 1·0 million lbs. of rated capacity.

(*a*) Rated capacity on the basis of 8-hour shift per day and 300 working days.

N.A.—Not available.

The present rated capacity of the industry is about 20·0 million lbs. of average count on the basis of a single shift of 8 hours per day. Some of the mills are, however, working more than one shift, so that the industry has a higher potential installed capacity as indicated by actual production in certain years. Woollen manufactures consist of blankets, rugs, shawls, *lohis*, coating, overcoating, tweed, flannel, serge, etc. Production is mostly confined to the coarser and heavier types of goods and has ranged between 17·3 and 24·0 million lbs. since 1947 as under :—

Production of woollen manufactures

Year	Quantity (million lbs.)
1947	24·0
1948	20·0
1949	21·0
1950	18·1
1951	17·7

The fall in production during the last 2 years was mainly due to the difficulty of marketing the goods as a result of consumer resistance to high prices.

(b) *Capital and labour.*—The total capital employed in the industry is estimated to be Rs. 7·0 crores, and the number of workers about 18,000.

(c) *Raw materials*—(1) *Wool.*—As regards the availability of the principal raw material, wool, the partition of the country has not affected this industry to the same extent as the cotton and jute textile industries. The total output of indigenous wool is as much as 55 million lbs. a year ; but the types of wool produced are not suitable for the manufacture of the finer fabrics and are mainly used for producing carpets and the heavier and coarser types of woollen goods. The finer fabrics are produced from imported wool. According to the Report of the Panel on Wool Industry (1947) different types of wool are utilised as follows :—

(i) Indian plain wools (coarse types and fine types) for army blankets and woollen carpet yarns, tweeds, overcoating, rugs, etc. ;

(ii) hill types for serge yarn and low grade hosiery ;

(iii) cross-bred wools for medium serge warps, worsted wefts and medium hosiery yarns ;

(iv) merino wools for flannels, overcoating, superfine broad cloths.

Based on quality, the estimated annual requirements of the mechanised woollen industry for working at the rated capacity (20·15 million lbs.) are as follows :—

Type	Quality	Quantity (million lbs.) Greasy basis
Worsted oil combed tops	46's to 64's	7·9
Greasy combing wools	46's to 60's	3·2
Greasy clothing wools	46's to 64's	6·6
Scoured combing wools	46's to 60's	1·1
Scoured clothing	46's to 60's	0·1
Indigenous wools	..	15·0
TOTAL		33·9

The actual consumption of indigenous and imported wool (greasy basis) by the mechanised industry during the last few years has been approximately as follows:—

Estimated indigenous wool	15 million lbs.
Imported raw wool	Between 5 to 8 million lbs.
Imported tops	Between 8 to 13 million lbs.
TOTAL	Between 30 to 33 million lbs.

The consumption of indigenous wool by the mechanised industry in 1950 accounted for about 25 per cent. of the total supplies of such wool available.

Estimated supplies (indigenous wool)	Million lbs.
Estimated indigenous wool clip	54·8
Arrivals through land frontiers	8·0
Estimated utilisation (indigenous wool)	
Exports of raw wool	24·6
Consumption in carpet and drugget industry	13·2
Approximate consumption by the cottage sector	10·0
Consumption by the mechanised wool industry	15·0
TOTAL	62·8

Imports of raw wool and wool tops in 1950 from different countries were as follows:—

	Actual weight (million lbs.)	Weight on greasy basis (million lbs.)
Tops from the U. K.	6·50	13·00
Greasy wool from New Zealand	1·20	1·20
Scoured wool from New Zealand	0·69	0·92
Greasy wool from Australia	0·90	0·90
Scoured and carbonised wool from Australia	0·56	1·21
Other wool presumably from Persian Gulf or tops from Australia	0·91	0·91
TOTAL	10·76	18·14

(2) Other raw materials required in small quantities are artificial fibres for mixing with wools, sizing materials, dyestuffs and chemicals.

(d) *Imports and exports.*—Owing to restrictions on the imports of finished woollen goods in recent years, there has been a gradual decline in imports as shown below. On the

other hand, exports have shown appreciable expansion, particularly exports of carpets.

Imports

(Quantity in thousand lbs. and value in lakhs of Rs.)

	1948-49		1949-50		1950-51		1951-52	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1. Blankets and rugs including woollen blankets, mixed with other materials but excluding floor rugs.	3,720	102	4,524	103	215	4	16	1
2. Carpets and floor rugs	243	12	95	6	18	1	15	1
3. Hosiery (woollen knitted apparel and other sorts).	121	18	51	4	87	10	49	12
4. Woollen and worsted piecegoods.	2,682	310	1,825	164	110	13	367	45
5. Woollen goods mixed with others.	1,356	81	2,119	94	110	7	381	26
6. Ruffle cloth and shawl cloth, roller cloth, clearer cloth, and sizing flannel, etc.	147	11	108	9	143	13	165	23
7. Shawls and *lohis* (numbers '000).	2	Negligible	32	4	·039	Negligible	·002	Negligible
8. Other sorts	986	36	628	21	203	9	468	18
9. Yarn and knitting wool.	1,921	154	2,948	192	908	109	2,502	172
Total of woollen manufacture.	11,176	724	12,298	598	1,794	165	3,963	298

In order to obtain the value of net imports, the value of re-exports (1948-49—Rs. 17 lakhs, 1949-50—Rs. 11 lakhs and 1950-51—Rs. 2 lakhs) has to be subtracted from the above figures.

Exports

(Quantity in thousand lbs. and value in lakhs of Rs.)

	1948-49		1949-50		1950-51		1951-52	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1. Carpets and rugs	8,334	261	10,446	331	14,091	556	11,591	589
2. Piecegoods (yds. '000)	44	4	32	2	21	2	64	8
3. Shawls (numbers '000)	35	5	48	7	56	8	39	6
4. Other sorts ('000 lbs.)	844	34	1,316	26	1,476	40	1,219	46
TOTAL	..	304	..	366	..	606	..	649

(e) *Estimated consumption and requirements.*—As already mentioned, consumption of woollen goods in India is low in comparison with other countries. The present consumption is estimated at 20-21 million lbs. per annum. As regards future consumption, unless there is a substantial fall in the prices of raw wool and consequently of woollen manufactures, there are no prospects of expansion beyond what would be necessitated by an increase in

population. On the assumption that prices continue at the present level during the period of the Plan the future demand by 1955-56 may be estimated at about 23·0 million lbs. of woollen goods.

II. Problems of the Industry

During the last few years the woollen industry has been handicapped by inadequate supplies of wool tops and the absence of facilities for technical training as explained below :—

(i) *Availability of raw material.*—As already indicated, the worsted section of the woollen industry is entirely dependent on high grade wool and tops imported from the U. K. and Australia. The wool tops account for as much as 75 per cent. of the total imports. Production in 1950 and the first half of 1951 was adversely affected owing to the non-availability of the finer qualities of imported raw wool and wool tops in adequate quantities and at reasonable prices for the manufacture of superior types of fabric. The Government have taken steps to increase production by removing restrictions on imports of raw wool and wool tops and by liberalising the imports of fibre tops required for the manufacture of mixed fabrics. Exports of indigenous wool are being permitted having regard to the requirements of the indigenous woollen industry and other small-scale consumer industries.

(ii) *Technical training facilities.*—There is at present considerable dearth of technicians for this industry with the result that the major units have to engage foreign technicians. There are no facilities in the country for training wool technologists who have to be trained abroad. This lacuna needs to be removed.

III. Programme of Development

(a) *Existing programme.*—Two new units which were under construction in 1950 have gone into production in 1951. In addition another two units are likely to be established for woollen goods apart from the installation of spinning plants for additional production of worsted yarn.

(b) *Recommendations.*—(1) In view of the fact that the indigenous demand, which is estimated at 23·0 million lbs. of woollen manufactures by 1955-56, could be satisfied if some of the mills worked double shift and the existing capacity was fully utilised, the establishment of new weaving units during the period of the Plan is not necessary. In the post-war years, the small-scale units and the hosiery industry have not worked to their installed capacity owing to lack of fine yarn. It might perhaps be necessary to instal 30,000 additional spindles for the manufacture of fine yarn. This would also help to reduce imports of yarn to some extent. In this connection, it might be worthwhile investigating the possibility of having additional spindleage on a cooperative basis in which the consumers of yarn would be the owners of the enterprise.

(2) *Raw wool*—(i) *Better breeding.*—The breeding of sheep requires particular attention so as to increase the yield per sheep and improve the quality of the wool. As experiments of cross-breeding have proved successful, this should be pursued further and applied on a commercial scale to reduce the dependence of India on imported raw wool. Though it may not be possible to produce long-staple wool in the plains due to climatic conditions, selective and scientific cross-breeding would render possible the production of

finer qualities in short staples. Breeding centres in Kashmir and other suitable hilly regions should be started so that long staple wool can also be produced in sufficient quantities.

(ii) *Washing and grading.*—Washing of wool before shearing and grading before marketing is important and deserves early attention since defective marketing of raw wool has handicapped the indigenous woollen textile industry as well as the export trade.

(iii) Standards of wool should be fixed immediately and grading of wool made compulsory.

The following table summarises the programme of development of the woollen textile industry (mechanised section):—

	1950-51	1955-56
Number of spindles in existence	116,800	146,800
Annual rated capacity for cloth on single shift (million lbs.)	20·15	20·15
Actual production (million lbs.)	18·00	25·00
Estimated requirements (million lbs.)	20·00	23·00

G. Timber Industries

37. MATCHES

Until the early twenties, India depended entirely on imports of matches from Sweden, Japan and other countries for meeting her requirements of this article of daily utility. The match industry in India owes its origin to Swedish enterprise. The first of their chain of factories was set up in 1926 by the Western India Match Company Ltd. (WIMCo) at Ambernath near Bombay and was followed by the establishment of other factories at Madras, Bareilly (U. P.), Calcutta and Dhubri (Assam). During 1926-28, the Tariff Board inquired into the claim for protection of this industry and in pursuance of its recommendations, which were accepted by the Government, protective import duties were introduced in order to encourage domestic production and gradually eliminate imports. This gave an impetus to the growth of the industry in the country, and a large portion of India's total consumption of matches began to be met by Indian manufacturers. At present, the industry supplies the entire internal requirements of matches and also exports limited quantities to neighbouring countries like Pakistan, Ceylon, Malaya, etc.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—In addition to the five units owned and run by the Western India Match Company Ltd., and its associate, the Assam Match Co. Ltd. (AMCo), there are over 200 smaller units operating in the country. Many of them are cottage type factories manufacturing less than 100 gross boxes per day* in which all or most of the operations are done by hand. In 1949, the total number of units licensed for operation came to 192, of which 75 were classified as of the cottage type, the remaining being reckoned as major factories. Both the cottage and large-scale units are run by private enterprise.

The major factories are located in Bombay, Calcutta, Madras, Uttar Pradesh and Assam. Sattur and Sivakasi in the Ramnad District and Kovilpatti in the Tinnevelly District of Madras are the main centres of cottage type production.

The total annual rated capacity of the match industry is 35·3 million gross boxes (706,000 cases, each of 50 gross boxes of 60 sticks). Of this, WIMCo and AMCo account for 22·8 million gross boxes (456,000 cases) or nearly 65 per cent. of the total capacity.

Though the rated capacity is estimated at 35·3 million gross boxes, the actual production in the pre-Plan period has been far below this figure. However, as against a production of 27 million gross boxes in 1949-50 and 29·1 million gross boxes in 1950-51, the output increased to 31·9 million gross boxes in 1951-52, thus showing considerable improvement. While the major units have been working at about 95 per cent. of their rated capacity in 1951-52, the production of the smaller units including cottage units has been at about 80 per cent. of their capacity.

The comparative output of WIMCo factories and the small factories in Ramnad, Tinnevelly, Shimoga and Alwaye given below shows that the production of both has been

*Generally, units manufacturing less than 100 gross boxes per day are described as 'cottage' type.

on the increase in post-war years and it was not always the big factories which adversely affected the interests of small producers :—

Year	Comparative output* (in million gross boxes) WIMCo Factories	Factories in Ramnad, Tinnevelly, Shimoga and Alwaye
1946	14·4	2·6
1947	13·7	4·6
1948	17·3	3·8
1949	18·9	4·1
1950	17·8	5·5

(b) *Capital and labour.*—The total productive capital employed in 1949 is estimated to be about Rs. 2·7 crores; this includes the investment of only 53 out of the 57 registered factories. The capital investment on the smaller units cannot be easily computed. The total number of persons employed in the match industry is estimated to be 20,000. In 53 of the registered factories, 13,676 persons were employed in 1949. The majority of workers in the cottage type units consist of agriculturists and labourers who take to this occupation to supplement their normal income. It is, therefore, not possible to estimate accurately the amount of manpower employed in the industry.

(c) *Raw materials.*—The principal raw materials of the match industry are matchwood, potassium chlorate, phosphorus, sulphur, match paper and glue. Of these, phosphorus and sulphur are entirely imported, whereas matchwood and glue are obtained from indigenous sources, and match paper and potassium chlorate are drawn from both sources. The requirements of these raw materials for a production of ten million gross boxes are estimated as follows: —

Matchwood	44,440	to
Potassium chlorate	625·0	,,
Phosphorus (amorphous)	50·0	,,
Sulphur	62·5	,,
Match paper	900·0	,,
Glue	125·0	,,

(d) *Imports and exports.*—Imports of matches have recently been negligible, amounting to only 136 gross boxes in 1949-50, 5,910 gross boxes in 1950-51 and 479 gross boxes in 1951-52. On the other hand, exports have been quite significant and amounted to 305,000 gross boxes in 1949-50, 75,509 gross boxes in 1950-51 and 15,470 gross boxes in 1951-52.

(e) *Estimated consumption and requirements.*—On the basis of statistics of indigenous production, imports and exports, the consumption of matches in the country was 26·7 million gross in 1949-50. It has been estimated that the requirements of matches will increase at the rate of 5 per cent. per annum. On this basis, the consumption of matches in 1950-51 is estimated at 28 million gross boxes. Assuming the same rate of expansion of demand, domestic requirements will increase by 7 millions by the end of the period of the Plan. The demand for exports is estimated at the 1949-50 level of 0·3 million gross boxes during the period of the Plan. The total demand for matches by 1955-56 is, therefore, expected to be 35·3 million gross boxes.

II. Problems of the Industry

The main problem of the match industry arises from the partition and the consequent loss of the West Pakistan market leading to shrinkage of demand.

**Source* : Department of Central Excise.

As regards raw materials, the present position is far from satisfactory since supplies of soft woods, more particularly *semal* wood (Bombax Malabaricum), are fast being depleted. The industry is decidedly short of this raw material and planned efforts are necessary to raise plantations of matchwood species.

The supply of match chemicals has also become difficult and adequate quantities of phosphorus and sulphur are necessary for ensuring full and regular production.

The cottage- and small-scale section of the industry is forced to pay high prices for raw materials which makes production uneconomic. Bulk purchase of requirements and marketing of matches through industrial cooperatives would go a long way towards alleviating this difficulty.

III. Programme of Development

Development plan.—In evolving a plan for the expansion of indigenous production so as to meet the requirements entirely from domestic sources, attention has to be given to the following lines of development :—

(i) stepping up production by the WIMCo and AMCo factories to over 95 per cent. of their rated capacity and by the other units to over 85 per cent. of their capacity by 1955-56 ;

(ii) decentralised production through the establishment of a new class of cottage factory having a daily production capacity of 50 gross boxes. This new class has been suggested with a view to provide a subsidiary occupation in rural areas and towns. On the basis of this pattern, the production of WIMCo and AMCo factories is expected to be about 21·8 million gross boxes which has already been achieved by these units in 1951-52. The production of the remaining units in existence which had a combined capacity of 12·5 million gross boxes in 1950-51 is expected to increase from the level of 8·35 million gross boxes to 10·9 million gross boxes by 1955-56. This would bring the total production of all existing units to 32·7 million gross boxes, thus leaving a deficit of 2·6 million gross boxes which will be partly covered through the establishment of the new class of cottage unit mentioned above. The capital investment required for such units to produce 2·6 million gross boxes is estimated at Rs. 50 lakhs. To enable the small and cottage units to expand production and to facilitate the organisation of additional cottage units on an economic basis, it is of the utmost importance to organise these producers into industrial cooperatives for the bulk purchase of raw materials and the sale of finished products.

The successful implementation of the development plan, as well as the long-term plans of the match industry, depends on the immediate adoption of measures to ensure the necessary supplies of raw materials, particularly matchwood. The present supply position of raw materials is unsatisfactory. However, about 24,000 tons of matchwood might become available from the Andamans in 1951-52 ; and by 1955-56 this is expected to go up to 66,000 tons which is about 50 per cent. of the present demand. The balance of requirements of matchwood has to be met from inland sources and in this connection, systematic plantation of *semal* trees and the reservation of this species of wood for the match industry have to be accepted as the basis of a policy for augmenting such resources on the mainland.

Additional capacity should be provided in India for the manufacture of all the potassium chlorate required by the match industry. The paper industry should also arrange to produce better qualities of match paper so that the entire requirements could be met from indigenous production. As regards phosphorus and sulphur, the two other important raw materials required by the match industry, there are no sources available in India for ensuring their supply. Of these, the quantity of sulphur required would be only of the order of about 220 tons per annum, while that of phosphorus is approximately 175 tons by 1955-56. The requirements of the match industry for sulphur being small in comparison with those of other consumers and deserving of priority, they should be met in full from the limited imports which may be possible. As regards phosphorus, the quantity required is too small to justify its production immediately. In the circumstances, stockpiling for meeting the industry's requirements is the best alternative.

The production programme during the period of the Plan does not provide for expansion of exports because Indian matches may not be able to compete in foreign markets, particularly in Western Pakistan, unless the industry is enabled to reduce its selling price through a reduction in costs of production and lowering of the excise duty. It is, however, expected that the present level of exports would be maintained during the period of the Plan.

(b) *Recommendations.*—(i) The medium and cottage scale manufacturers of matches have an important place in the national economy, since they help to provide employment for persons who might be otherwise under-employed or displaced from the land as a result of the rationalisation of agriculture. Hence, for stepping up production to meet the increasing demand, cottage type or small-scale units should be established, especially in view of the fact that the existing large-scale factories are already producing up to 90 per cent. of their rated capacity and are not in a position to increase their production without heavy investment.

(ii) State Governments should encourage the association of small-scale producers on cooperative lines for facilitating supply of raw materials, distribution of finished products and improvement of efficiency.

(iii) (*a*) All available *semal* trees should be reserved for the exclusive use of the match industry.

(*b*) A planned effort should be made to raise plantations of matchwood species.

(*c*) Fixation of matchwood prices by the States should be centrally controlled and indiscriminate exploitation of forest resources should be discouraged.

(*d*) There should be a uniform forest policy throughout the country in regard to the utilisation of matchwood species.

(iv) For meeting expenditure in connection with the raising of matchwood plantations, the Government should consider allotment of 1 per cent. of the total excise revenue derived from matches for the development work.

(v) The sizes of match boxes should be standardised and it might be desirable to restrict production to boxes containing 60 sticks only.

The table given below summarises the programme of development of the industry during the period of the Plan :—

	Unit	1950-51	1955-56
Annual rated capacity	Million gross boxes	35·3	38·3
Actual production	,,	29·1	35·3

38. PLYWOOD

Plywood manufactured in India is either casein-bonded or resin-bonded. Casein-bonded plywood is much in demand for tea chests, but for other purposes, resin-bonded plywood is widely used. Compared to solid wood of equal weight plywood is more homogenous, changes less in dimension due to moisture and resists strain to a greater degree. High grade resin-bonded plywood is used in aeroplanes, coach-building and by the Defence Services for various purposes. It is also extensively used for panelling and for the manufacture of utility furniture, cabinetware, etc. Whereas tea chest plywood has a guaranteed off-take but one which is limited by exports of tea, commercial plywood is expected to find increasing use in this country as in other parts of the world.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—The indigenous plywood industry, which came into existence in 1917 with the commencement of plywood manufacture by the Surma Valley Saw Mills, registered a remarkable growth during the last war, the number of manufacturing units rising to 75 in 1945 as against 2 in 1920 and 3 in 1938. The decline in Government purchases, coupled with unrestricted imports during the O. G. L. period, affected the industry adversely and protection was granted to it by the Government in 1948 on the recommendation of the Indian Tariff Board, which was renewed up to December 1952. Broadly speaking, the industry has shown an upward trend since the grant of protection though production has been considerably below rated capacity. The number of tea chest factories on the approved list of the Development Wing of the Ministry of Commerce and Industry rose from 29 (rated capacity 63·0 million sq. ft.) in 1948-49 to 34 (rated capacity 100 million sq. ft.) in 1949-50 and to 53 with an annual rated capacity of 150·0 million sq. ft. in January 1952, on the basis of a single 8-hour shift working for 300 days. By May 1952, the number of approved factories had increased to 57 and the capacity for tea chest plywood to 160·29 million sq. ft. as under:—

Regional distribution of plywood factories producing tea chests in May 1952

	Numbers	Annual rated capacity in million sq. ft.
Assam	6	18·81
West Bengal	32	56·34
Madras	7	27·36
Travancore-Cochin	6	32·94
Mysore	1	4·14
Bihar	1	1·08
Bombay	2	14·94
Madhya Pradesh	1	1·08
Orissa	1	3·60
TOTAL	57	160·29

In addition to the units mentioned above, there are a large number of cottage plywood factories, the bulk of which are concentrated in and around Calcutta. According to the

Bengal Plywood Manufacturers' Association, there were 40 cottage units in existence in the Calcutta area with a capital investment of Rs. 4·0 lakhs which have been producing 1,000 sets (18,000 sq. ft. of plywood) per day.

Production of plywood increased from 11·75 million sq. ft. in 1938 to a peak figure of 58·6 million sq. ft. in 1946. It went down to 34·33 million sq. ft. in 1947. Since then production of tea chest and commercial plywood has been as under:—

Year	Plywood		
	Tea Chest (million sq. ft.)	Commercial (million sq. ft.)	Total (million sq. ft.)
1948	45·12	8·64	53·76
1949	38·40	9·24	47·64
1950	41·40	8·88	50·28
1951	60·17	10·15	70·32

(b) *Capital and labour.*—Information regarding the capital and labour employed in the entire plywood industry is not available. According to the Monthly Statistics of Production of Selected Industries of India (January 1952), the fixed capital in 1950 of 32 factories from which returns were received was Rs. 94·0 lakhs. It is estimated that the total capital invested in industry is over Rs. 2·0 crores. The number of workers employed by the 32 factories mentioned above was 3,000.

(c) *Raw materials.*—Soft timber is the principal raw material of this industry. Some of the popular species used are 'Gurjan', 'Hollock', 'Hollong', and 'Vellapiney'. Mango which is universally available is another important species. Vellapiney is used by the manufacturers in the South and makes tea chests of an attractive colour and finish, provided the treatment is carried out in such a manner as not to add a stain.

Casein is the most important bonding material in the manufacture of tea chest plywoods. Synthetic resins such as phenol-formaldehyde and urea-formaldehyde are used in the production of commercial plywood.

The requirements of timber and casein for a production of 100 million sq. ft. of tea chest plywood are estimated at 100,000 tons and 2,500 tons respectively.

Small quantities of lime, copper sulphate, borax and other chemicals are also used by the plywood industry.

(d) *Imports.*—The accounts relating to the Sea-borne Trade of India do not give the imports of plywood in terms of quantity. According to the Development Wing of the Ministry of Commerce and Industry, imports in the last five years were as under:—

Year	Import quota fixed (million chests)	Value of tea chest imported (Rs. crores)
1947	2·2	1·1
1948	3·5	1·9
1949	1·0	1·3
1950	1·8	0·5
1951	2·2	1·5

Apart from direct protection, the plywood industry has been assisted in recent years through import control measures taken by the Government from balance of payments

considerations. The Tariff Board had recommended in its report on the grant of protection to the Plywood Industry (1950) that the Government should take into consideration the capacity of the indigenous industry in fixing quotas for import. So long as strict control over quality is exercised, it may not endanger consumer interests to impose restrictions on import: otherwise a tendency to expand output quantitatively without regard for quality might manifest itself. It is, therefore, necessary to review the policy of linking up import with domestic production every year on the basis of the actual performance of the industry.

(e) *Estimated consumption and requirements*—(i) Plywood for tea chests.—The interim Tariff Board in 1947 estimated the annual demand for tea chests of the standard size 19″ × 19″ × 24″ at over 5·5 million chests requiring approximately 100 million sq. ft. of plywood of 3-ply 3/16″. This appears likely to continue to be the approximate demand for the next two years as no considerable increase in exports of tea has been envisaged. It might rise to 110 million sq. ft. by 1955-56.

(ii) Commercial plywood.—It is somewhat difficult to estimate the trends of demand for commercial plywood in future years because of the possibilities of substitution of this material by other products. For instance, it is reported that panels made of delignified bamboo whose manufacture is being contemplated in Orissa might become a powerful competitor of commercial plywood. Further, hard-boards like Masonite made out of bagasse and other raw materials have considerable potentialities for replacing partially at least commercial plywood in certain consumer industries. As these trends in the use of substitute materials are likely to become increasingly evident, it is anticipated that the demand for commercial plywood by 1955-56 will be of the order of about 40 million sq. ft., *i.e.*, less by about 10 million sq. ft. than the present estimated demand.

II. Problems of the Industry

(*a*) Apart from the contraction of Government demand and substantial imports of tea chest plywood in 1948-49, difficulties in the procurement of and the high prices of raw materials have been problems which the industry had to face in recent years. With the declaration of Pakistan as a foreign territory for commercial purposes in March 1948, the factories in Calcutta which were formerly drawing timber from East Bengal were cut off from this source of supply. The South Indian factories had difficulties in moving timber from forests to the factories due to the inadequate supply of petrol. Further, the current policies of the State Governments of auctioning timber to the highest bidders do not take sufficient cognizance of the importance of providing a steady supply of timber to the industry at negotiated and reasonable prices. The system has led to the intervention of middlemen, higher costs and diversion of plywood timber to other purposes. It has been contended on behalf of the State Governments that the plywood manufacturers in each zone could buy lots in auction sales and, after meeting their requirements, dispose of the surplus to the trade. While the policies of State Governments, based on revenue considerations, seem justified from certain aspects, it is necessary to evolve a formula and procedure, which, without sacrificing revenue excessively, would also safeguard the interests of the plywood industry. The supplies of plywood timber to be derived from the exploitation of the forests in the North and South Andamans which are expected to reach a figure of 45,000 tons by 1955-56, will relieve the shortage to some extent. It is expected that the overall domestic availability of timber to the plywood industry cannot be stepped up beyond 110,000 tons by 1955-56.

(*b*) While the demand for casein has been estimated at 2,500 tons, indigenous supplies are only of the order of 600 tons, so that the industry is dependent for nearly 75 per cent of its requirements on imports, the main suppliers of which are Argentina and New Zealand. Roughly, 1 lb. of casein is required for the manufacture of one tea chest of standard size 19″ × 19″ × 24″. The incidence of the cost of casein on the total cost of production of tea chests is appreciable and its price in the Indian markets has been subject to wide fluctuations ranging between Rs. 1,200 and Rs. 7,000 per ton during the last few years. This speculative tendency in the price of casein depends on the following factors:—

(i) the indigenous production of butter;

(ii) the demand of the plywood industry for casein; and

(iii) the availability of imported casein.

With the outbreak of the Korean War there has been a steep rise in the price of imported casein, a scarce material even in the international markets. In order to conserve the supplies of casein and ensure its availability to the tea chest industry, control was clamped down on its distribution under the Supply and Prices of Goods Act No. XXVI of 1950. Casein is also manufactured in India on a cottage basis, and SRO No. 980, dated the 2nd December 1950, exempts small dairy farmers producing crude casein (unground and unsieved not exceeding 300 lbs. per month) from the control. Under P. C. 10(1)/50 dated the 21st April 1951, the price to be charged by a dealer or producer for Indian casein was also fixed. Permits for the sale of Indian casein at prices not exceeding the control rate are issued by the Development Wing of the Ministry of Commerce and Industry, and permits for the sale of foreign casein in India at prices not exceeding the landed cost are also issued. Despite the current indication of a slight decrease in the price of foreign casein, there is still need for the continuance of the control. Since the enforcement of control, there has been an increase in the indigenous production of casein by about 33 per cent.

It is said that certain foreign countries have found substitute for casein and that its use for plywood manufacture is on the decline. Even in this country it should be possible to use adhesives such as protein glues and resin glues in place of casein in the manufacture of tea chests. But this would entail provision of special equipment (hot press) for pressing. The Forest Research Institute, Dehra Dun, should conduct research into the various types of glues for the benefit of the indigenous industry, as divergent opinions have been expressed before the Tariff Board regarding the results obtained by the use of protein glue adhesives.

(*c*) Thirdly, a cause for considerable anxiety to the tea chest industry is the preference of the shipping companies and the traders for imported chests over the Indian products. The chief defects complained of are a low standard of packing, the somewhat brittle nature of Indian wood and the susceptibility of the indigenous chests to weevil attack. The principal requirements which the tea chests should fulfil are the following:—

(i) the panels should not impart any taint to the tea packed,

(ii) they should not be liable to termite or borer infection.

(iii) they should be strong and light so as to prevent loss during transhipment, and

(iv) they should be properly dried, and the adhesive used must stand the test of water resistance.

Heavy losses have to be sustained by the tea industry when the chests give way during transit by reason of the weakness of the panels. As for borer attacks, if timber was properly

treated as stipulated in the Indian standard specification, all chests manufactured out of such timber would be free from borer infection.

The quality aspect of plywood tea chests was examined in detail during the enquiry conducted by the Tariff Board in 1950 and the conclusion reached was that since the last Tariff Board enquiry the quality of the indigenous tea chests had shown definite improvement, but that further improvement was called for. It is absolutely essential to ensure that only quality chests are supplied to the tea industry as otherwise it would be unable to face competition from the tea industries of Ceylon, Indonesia, China and East Africa in the foreign markets, and this circumstance would prove highly detrimental to the country's export trade. In view, therefore, of the paramount importance to India of the export of tea at the present juncture when the country requires to secure all the foreign exchange possible, the maintenance of strict standards as regards tea chests is an urgent necessity. Regional Inspectorates set up under the former D. G. I. & S. at Calcutta and in South India have contributed to ensure quality control. The industry should voluntarily extend these activities for overcoming the prejudice of consumers.

As for commercial plywood, the indigenous manufactures are not, in the opinion of the Tariff Board (Report 1950), inferior to the imported variety. In its own interest the industry must impose upon itself strict conformity with the specifications laid down by the Indian Standards Institution as regards requirements for plywood, standard sizes for tea chests and components, the tare and the tests for plywood and tea chests.

(*d*) Lastly, the tea chest industry suffers from lack of orders stemming from the reluctance of the tea industry to consume its products. One reason is their higher price. The industry should be given every encouragement to mechanise production, improve quality and reduce costs.

III. Programme of Development

(a) *Existing programme.*—At the beginning of the period of the Plan schemes of expansion were under implementation in a number of existing plywood factories, and some of the unrecognised factories were installing the necessary machinery and equipment for being accepted as approved manufacturers. As a result of both these factors, the rated capacity of the approved factories increased to about 160 million sq. ft. by May 1952, as against requirements estimated at 150 million sq. ft. of tea chest and commercial plywood by 1955-56. Apart from the expansion by existing manufacturers, the following schemes, which, on implementation, would increase the rated capacity to 180 to 190 million sq. ft. are under consideration:—

(i) The Plywood Manufacturers Association of India have a scheme for setting up a veneer and plywood mill in the South Andamans which will produce 30,000 sq. ft. of 3-ply panels 3/16" thick per day. The cost of the plant is estimated at Rs. 22·0 lakhs including Rs. 5·0 lakhs of working capital and the consumption of timber at 7,500 tons per annum. It is envisaged that 50 per cent. of the capital will be raised by the Members of the Association.

(ii) Messrs. Khaitan & Co. have under consideration a scheme for the establishment of a plywood factory in the Mariani area in Assam.

(iii) A scheme for the establishment of a peeling unit by Messrs. P. C. Ray & Co. for the production of veneers in the North Andamans is also under consideration.

(b) *Recommendations.*—(i) It is necessary to state in connection with the schemes that any new plant would have to be visualised in terms of an economic unit whose size is estimated at 1 million sq. ft. of plywood per annum. Most of the existing plywood factories are uneconomic in size and some of them are situated disadvantageously. The size of each of the new plants projected being of the order of 1 million sq. ft. per annum, it should be possible for them to manufacture plywood more cheaply. Further, they would be located near the sources of supply of raw materials in Assam and the Andamans and transport bottlenecks in the movement of raw materials would be obviated. On the other hand, the establishment of these new units might make it difficult to meet the requirements of timber for all the factories that would be in existence. Further, as a result of the coming into existence of these new units, some of the marginal units and cottage plywood factories might find the conditions too hard for them to survive.

However, in view of the importance of ensuring cheap and high grade plywood to the tea trade, and the advantages that would ensue from the locational viewpoint, these new units may have to be allowed to be established. But as there is adequate capacity for meeting the requirements for tea-chest plywood, the development of these new units must be left entirely to private initiative. If institutions like the Industrial Finance Corporations are approached by the entrepreneurs for financial assistance, it should be a condition precedent to the grant of a loan that they would reserve at least a substantial part of their output for commercial plywood. This would mitigate the rigours of competition and at the same time facilitate the development of commercial plywood manufacture.

(ii) During the period of the Plan, the targets of production of plywood for tea chests should be: 60 million sq. ft. in 1951-52; 75 million sq. ft. in 1952-53; and 100 million sq. ft. by 1955-56. If the supply of raw materials shows improvement, facilitating additional production, the imports of tea chest plywood might be reviewed and correlated to increases in production. For assessing the demand accurately, the Central Tea Board should call for monthly returns from the gardens regarding their stocks of indigenous and imported tea chests at the end of each month and also their estimated requirements for the subsequent six months. Imports should be regulated on the basis of these data considered together with those of indigenous production.

(iii) The production of plywood for tea chests should conform to the standards laid down by the Indian Standards Institution (IS: 10-1949) so that quality will be ensured and exports of tea will not be jeopardised on this account. Purchases should be made according to the standards and the machinery for controlling the quality of production strengthened if found necessary. Commercial plywood should ordinarily conform to the I. S. specification for commercial and moisture-proof plywood (IS: 303-1951).

(iv) The plywood industry should reduce costs of production by increased mechanisation so that it will be in a position to withstand competition in due course without the aid of protection.

(v) The plywood industry should make increasing use of alternative timbers specified in the Indian Standard Specification (Appendix A of IS: 10-1949). In this connection, the Forest Research Institute, Dehra Dun, should conduct research on the proper processing of timbers recommended to the plywood industry.

(vi) The cottage plywood manufacturers around Calcutta who mainly consist of displaced persons from East Bengal depend upon this industry for their existence and it is necessary to assist this section of the industry suitably under programmes of assistance that

will be drawn up for cottage industries. This section of the plywood industry has under consideration a scheme to instal hydraulic presses and seasoning kilns on a cooperative basis so that, with the minimum investment, it would be possible for all of them to make use of mechanical methods in the manufacture of plywood. The organisation of production of cottage units on a cooperative basis would achieve improvement in the quality of plywood and is a development along correct lines. The Central and State Governments should render such assistance as may be necessary in this connection as the question is also linked with the rehabilitation of displaced persons.

The following is a summary of the programme of development of the tea chest plywood industry during the period of the Plan:—

	1950-51	1955-56
Annual rated capacity (million sq. ft.)	138·84	180 to 190·0
Actual production (million sq. ft.)	44·94	100·0

H. Food Industries

39. SALT

The salt industry occupies an important position in the industrial organisation of the country because of the manifold and crucial uses to which salt is put. Salt is not only an indispensable necessity of life but also a basic raw material required in the manufacture of heavy chemicals like soda ash, caustic soda, chlorine, etc. It is also used as a fertiliser for certain crops and fruit trees and forms an important constituent of some mixed fertilisers. Besides, it is required by some of the food-processing industries and for other purposes like leather processing, seasoning of timber, consolidation of clay in making *kutcha* roads, regeneration of zeolite in water softening plants, etc.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—The principal centres of salt manufacture in the Indian Union are as follows:—

(1) Marine Salt Works

(i) Saurashtra and Kutch	Bhavnagar, Jaffrabad, Jamnagar, Lavanpur, Porbandar, Bharai and Kandla.
(ii) Bombay	Dharasana, Bhayandar, Bhandup, Uran and Mithapur.
(iii) Madras	Naupada, Pennuguduru, Madras, Cuddalore, Adirampatnam and Tuticorin.
(iv) Orissa	Astarang (Puri) and Huma, Gokhurkuda, and Sumadi (Ganjam District).
(v) West Bengal	Contai (Midnapur).
(vi) Travancore and Cochin	West Coast and East Coast.

(2) Inland Sources

(vii) Rajasthan	Sambhar, Didwana and Pachbadra.
(viii) Bombay and Saurashtra	Kharaghoda and Kuda (Rann of Kutch).

(3) Salt Mines

(ix) Himachal Pradesh	Mandi.

In addition to the main centres mentioned above, there are also a number of small salt works operating on the Bombay and Coromandal coasts. Besides, there are untapped supplies of salt in the form of natural deposits at the Rann of Kutch and at Mandi, and formations in the large swamps of the Coromandal coast. A geological survey of the Mandi mines with a view to locating fresh deposits of rock salt is to be carried out soon. Further, the possibility of tapping subterranean brine in places where rainfall is high is also to be investigated shortly.

At present, there are 122 salt units with an annual productive capacity of about 2·804 million tons (76·3 million mds.), of which 6 units with a productive capacity of about 0·73 million tons (20 million mds.) are owned and operated by the Government. The total area under salt is estimated at about 82,000 acres as against 55,600 acres at the beginning of the period of the Plan, of which about 84 per cent. is owned and leased out by the Central

and the State Governments and the rest is privately-owned. In terms of actual production, however, Government factories now account for about 25·8 per cent. of the total output. In the private sector, the manufacture of salt is, to a large extent, still in the hands of small licensees or lessees of absentee proprietors, except in Saurashtra and Kutch, where each licensee has several hundred acres under cultivation.

Since the end of the last war, there has been a steady increase in the production of salt, except in 1949-50 when it went down to 2·12 million tons (57·5 million mds.), as compared to 2·34 million tons (63·6 million mds.) in the preceding year. During 1950-51, however, the total production increased to as much as 2·65 million tons (71·5 million mds.) and in 1951-52 the production of salt in different regions of the country was 2·8 million tons (76·1 million mds.) distributed as below:—

Regional production of salt in 1951-52

State	Production ('000 tons)
Bombay	644
Madras	736
Orissa	40
West Bengal	2
Rajasthan	494
Saurashtra	776
Mandi	5
Unlicensed factories	100
TOTAL	2,797

(b) *Capital and labour.*—The total block capital invested in the salt industry is now estimated at about Rs. 703 lakhs (about Rs. 595 lakhs in the marine salt works and Rs. 108 lakhs in the inland salt works). The total block capital invested in the Government Salt Works only has decreased from about Rs. 115 lakhs in 1948-49 to about Rs. 87 lakhs in 1950-51. The amount of working capital employed in the industry (including cash in hand) is about Rs. 250 lakhs. The total number of persons employed in the industry in 1948 was estimated at about 72,000 of which about 57,000 were employed in the marine salt works, about 14,000 in the inland salt works and about 600 in the Mandi mines.

(c) *Imports and exports.*—Imports of salt have steadily declined during the last three years. The total quantity of salt imported into India by sea and land was 0·34 million tons (9·26 million mds.) in 1948-49, 0·28 million tons (7·54 million mds.) in the following year and during 1950-51 the quantity imported amounted to only 0·14 million tons (3·73 million mds.). The principal sources of supply of salt for India have been Aden and its dependencies, Western Pakistan and Egypt.

The principal destinations of salt exported by sea are the Maldive Islands, Burma, Ceylon and, recently, Japan; and by land routes Nepal, Sikkim, Bhutan and Eastern Pakistan. Under the recent Indo-Pakistan Trade Agreement exports of *khari* salt, which is used exclusively for industrial purposes, are allowed from India to Eastern Pakistan without any licensing restrictions. The total exports of salt by sea and land amounted to

40,000 tons (1·08 million mds.) in 1948-49 and 0·13 million tons (3·65 million mds.) during 1949-50; the quantity sent to Eastern Pakistan by land routes was a little over 0·1 million tons (2·72 million mds.). In 1950-51, the total exports amounted to about 0·114 million tons (3·102 million mds.). A recent feature is the development of exports of salt to Japan.

(d) *Estimated consumption and requirements.*—During the period 1936 to 1940, the total quantity of salt available for consumption was on an average about 1·76 million tons (47·9 million mds.) per annum. Of this, about 1·45 million tons (39·6 million mds.) were contributed by indigenous production and about 0·31 million tons (8·5 million mds.) by imports. Exports amounted to about 7,300 tons (0·2 million mds.). There has been a substantial improvement in the availability in recent years and in 1950-51 the total quantity available for consumption was about 2·7 million tons (72·6 million mds.). With the present production of about 2·8 million tons (76·1 million mds.), as against the actual consumption of about 2·53 million tons (69·0 million mds.), it may be said that the country has already reached the position of self-sufficiency. However, as much as 0·13 million tons (3·73 million mds.) were imported in 1950-51 owing to the difficulties of railway transport and also due to a temporary interruption in coastal transport by sea arising from a dispute about freight rates between the salt manufacturers and the shipping companies at Calcutta. It was felt by the Government that in such a situation the only way to avert scarcity in certain areas, particularly West Bengal, was to allow imports of foreign salt.

The present consumption standards in India do not provide adequately for the requirements of the population, livestock, industry and agriculture. The industrial consumption of salt in India is relatively small, being only about 8 per cent. of the total production as against over 70 per cent. in highly industrialised countries like the United States and the United Kingdom. The quantity consumed by livestock is also very small being only a little more than 1 per cent. of the total consumption, though in a predominantly agricultural country like India it should be expected to rank only next to human consumption. Nearly 89 per cent. of the total production is believed to be consumed by the people. The overall *per capita* consumption of salt in India is estimated at about 15 lbs., as against 206 lbs. in the United States, 103 in the United Kingdom and 41 lbs. for the world as a whole.

The Salt Experts Committee in their report published in 1950 estimated that the total consumption would increase to 3·0 million tons (81·7 million mds.) by the end of the next five years; of this domestic consumption would account for 2·1 million tons (57·2 million mds.), industries (alkali, soap, paper, etc.) for about 0·4 million tons (10·8 million mds.), livestock and agriculture for about 0·3 million tons (8·2 million mds.), and curing of hides and fish, manufacture of dairy products and other miscellaneous uses for the remainder. The estimated consumption for industries appears to be on the high side in the light of the development plans of the consuming industries. However, in view of the fact that the overall levels of consumption in India are lower than in other countries, any surplus available from industrial uses might easily be absorbed in other uses. The total consumption of salt during the period of 1951-56 is not expected to show any rapid rise but will increase slowly to about 2·75 million tons (74·9 million mds.) by the end of 1952-53 and to about 3·0 million tons (81·7 million mds.) by the end of 1955-56.

(e) *Organisation, processes and techniques.*—The manufacture of salt in the private sector is mostly in the hands of small licensees or lessees of absentee proprietors, who are not fully conversant with the correct technique of manufacture and are more interested in achieving quick results than in producing salt of high quality. The workers are mostly illiterate and operate without much guidance. Further, except in Saurashtra and Kutch

where licensees have several hundreds of acres under cultivation, most of the holdings are small and dispersed, particularly in Madras and Travancore. In Madras, there are as many as 3,500 licensees for 17,000 acres of land under salt. The average holdings in Saurashtra ranges from 600 to 1,000 acres and production from 50 to 90 tons (1,360 to 2,450 mds.) per acre against the average yield in South India of about 40 tons (1,089 mds.) per acre.

Salt is produced exclusively by solar evaporation except in Mandi where rock salt is obtained by dry mining and is quarried from open pits. Although the processes and practice followed in India for manufacturing salt are generally similar to those employed in other countries, the technique does not always conform to scientific principles with the result that, apart from low yield, the quality of the salt produced is also poor in several of the centres of production. In better-designed works, however, where production is carried out under scientific control, the quality of the salt produced can stand comparison with the best salt produced by solar evaporation in other countries.

(f) *Cess on salt.*—A cess of 2 annas per maund on salt produced in private salt works and 3½ annas on salt produced in Government works is being levied for meeting the administrative charges of the Salt Commissioner's office. The total annual yield of the cess is estimated at about Rs. 90 lakhs of which an amount of about Rs. 40 lakhs is required for meeting the administrative expenses and most of the balance is proposed to be spent on the general development of the salt industry. Exports of salt by sea from other parts of the country to West Bengal were exempted from the payment of cess in the past, but the concession was cancelled from 1st February 1952. Exports of salt to Japan by sea from India are still exempted from cess.

II. Problems of the Industry

The principal problems of the industry relate to the consolidation of holdings, mechanisation of operations, improvement of quality, recovery of by-products, building up of reserves, the machinery of distribution and the burden of the cess on certain salt-consuming industries.

(a) *Consolidation and mechanisation.*—Labour charges being an important item in the cost of production of salt, the price of salt can be reduced if the factors leading to the employment of excessive labour are eliminated. This can be done by consolidation of small holdings on the one hand and mechanisation of operations on the other. Mechanisation is subject to certain limitations even though it is desirable particularly for those operations which involve drudgery and physical discomfort to labour. The salt pans, as designed at present in most of the salt factories, do not lend themselves easily to the use of mechanical harvesters. Moreover, large-scale displacement of labour may result from mechanisation and add to the existing unemployment and underemployment in the country. However, certain operations such as lifting of brine, bulk transport of salt, etc., can be mechanised to a considerable extent provided the necessary capital required is forthcoming.

It was the view of the Salt Experts Committee that artificial evaporation should be resorted to only for obtaining special grades of high quality salt, which are not directly obtainable by solar evaporation or when solar evaporation is rendered difficult owing to lack of level land or the short duration of fair-weather conditions. The Committee pointed out that the Mandi mines have no easy access to coal but considerable surplus power is available from Jogindernagar for working the salt deposits by alternative methods. They, therefore, suggested that evaporators worked on the thermo-compression principle be

preferred to the usual method of evaporation in pans or multiple-effect evaporators. Messrs. Eschar Wyss & Co., a Swiss firm have drawn up at the request of the Central Government a general lay-out and plan for a suitable evaporator plant for production of high grade salt at Mandi and have suggested wet mining as the best method of exploiting the Mandi salt deposits.

(b) *Recovery of by-products.*—It is possible to recover a variety of by-products along with salt from brine of various types except when salt is recovered in the pure condition. When salt is obtained by evaporation of sea water the by-products which can be recovered are gypsum, magnesium sulphate, magnesium chloride, potassium chloride and bromine. The by-products which can be recovered at Kharaghoda or Sambhar are sodium sulphate, sodium carbonate, potassium chloride and bromine. Since the country does not possess any deposits of natural sulphur and has to depend on imported sulphur or has to develop its own resources of other sulphur compounds for producing even strategic materials, the importance of recovering calcium sulphate, magnesium sulphate and sodium sulphate as by-products of salt manufacture needs no emphasis. Bromine is also a strategic material and, in addition, is the source of important products such as sodium and potassium bromide required in photography, for the production of dyestuffs and for pharmaceutical uses. A plant for the manufacture of bromine has already been put up by Tata Chemicals but although its present production is considered to be adequate to meet the country's present total requirements, the demand for bromine is likely to increase considerably in future.

(c) *Reserves.*—At present there is no compulsory enforcement of the requirement of maintaining 20 to 25 per cent. of stocks in reserve by all manufacturers. Under the Salt (Reserve Stocks) Order, 1950, however, every importer of salt in Calcutta is required to keep in Government godowns 10 to 25 per cent. of the salt imported while at other places it has been suggested by the Salt Commissioner that a 25 per cent. reserve should be kept. In Madras it is enforced because it is provided for in the licences. The country cannot afford to do without reserves so long as climatic and weather conditions create uncertainty about the quantum of production. At present, therefore, the stocks provided by reserves cannot be dispensed with although they might be reduced when production is found to be considerably in excess of requirements.

(d) *Distribution.*—With a view to utilising the available transport facilities to the maximum advantage, manufacturers in different parts of the country are assigned definite distribution zones and restrictions are placed on the movement of salt between different consuming centres. This scheme of zonal distribution of salt for despatch by rail was introduced by the Salt Commissioner from January 1, 1949. Under it, the quota fixed for distribution within the zones is given a preferential treatment over the movement of stocks in excess of the zonal quota to other parts of the country. The Government have recently accepted the Salt Experts Committee's recommendation to retain the zonal system of distribution and to effect adjustments wherever necessary to reduce the maximum lead to 750 miles. The District Nominee System, which is part of the existing machinery of distribution in some of the States in the Indian Union including Bihar, Uttar Pradesh, Punjab, Assam, etc., has been criticised on the ground that it gives a monopoly of trade in salt to a few persons. In fact, however, the total number of district nominees actually exceeds 1,600. Also certain States feel that unless full and free transport facilities are assured, abolition of the Nominee System is likely to result in scarcity of salt in certain areas or in an increase in prices.

(e) *Cess on salt.*—The cess on salt is criticised by some persons on the ground that salt consumed by industries was exempted from the old excise duty. The cess is said to impose a particularly intolerable burden on the chemical industry. Although the total consumption of salt by the chemical industry is negligible at present, it is expected to be a little less than 0·4 million tons (10·9 million mds.) by the end of 1955-56.

III. Programme of Development

(a) *Existing programme.*—Outlines of short- and long-term plans for the development of the salt industry were prepared after the transfer of the Salt Department to the Ministry of Industry and Supply with effect from the 1st November 1947 and were examined first by a sub-committee of the Cabinet and later on approved by the Cabinet in December 1947. To implement the proposals for long-term improvements a Salt Experts Committee was appointed in April 1948 to examine the existing methods of production in Government as well as private salt works and to make recommendations regarding the steps to be taken to increase production, improve quality and reduce the costs of production. The Committee was also asked to indicate the areas in which new salt works could be established and to report on the necessity or usefulness of model factories and the extent to which technical assistance could be given to the private salt works to enable them to increase production and improve quality. In view of the urgent need for increasing the production of salt as quickly as possible and to enable the Government to adopt immediate remedial measures, the Salt Experts Committee submitted two Interim Reports to Government—the first in June 1948 and the second in January 1949. Most of the recommendations in the two Reports have been implemented or are in course of implementation.

The Committee submitted its final report in May 1950 which contains 286 recommendations covering such matters as general principles for the production of solar salt on scientific lines, general problems concerning the salt administration in the country, improvements to be affected in the Government salt works located at Rajasthan and Kharaghoda, in the Mandi mines and also in the private salt works, and investigations to determine the possibility of salt production in Bharatpur (Rajasthan), Sultanpur (Punjab) and the Great Rann of Kutch. The Government have so far accepted by a Resolution announced early in August 1951, 119 recommendations, the more important of which relate to the setting up of a Salt Advisory Committee representing the Government, manufacturers, consumers and importers; suspension of payments under treaty rights to the States as compensation for suppression of salt manufacture, etc., and the abolition of the system of marketing salt through registered dealers at Sambhar and Kharaghoda. A large number of the recommendations are, however, still under consideration by the Government; these relate to such matters as the modification of the present organisation of the Salt Department into a Development Department; revision and simplification of the present terms under which licences for the manufacture of salt are issued and consolidation or expansion of small holdings into economic units and their realignment.

The development plans of the salt industry in the private sector are not known; nor have the actual costs of implementing the plans recommended by the Salt Experts Committee been worked out. Certain development schemes for the existing Government salt works at Rajasthan and Kharaghoda involving an expenditure of Rs. 50 lakhs have been approved for execution during 1951-56; of this about Rs. 7 lakhs would be spent in the hard currency area for importing certain plant and equipment and a little over Rs. 5 lakhs in the soft currency area. Of the total expenditure, about Rs. 4·3 lakhs would be

required during 1951-52, another Rs. 8·0 lakhs or so during 1952-53 and the remainder during the three subsequent years. In addition to these development schemes a sum of Rs. 100 lakhs is to be spent on the development of the Mandi mines to obtain an annual output of 66,000 tons (1·8 million mds.) of salt from 1955-56 onwards. Of the total expenditure, about Rs. 10 lakhs would be required during 1952-53 and Rs. 80 lakhs during 1953-54. The hard currency expenditure on imports of certain machinery and equipment during the next five years would amount to Rs. 60 lakhs. As a result of the implementation of these development plans and all the other recommendations of the Salt Experts Committee, the production of salt is expected to be raised to 3·08 million tons (83·7 million mds.) by 1955-56. This would enable the indigenous requirements to be met in full at the present level of consumption and leave some surplus for export to some of the neighbouring countries. It may be noted in this connection that while the production of the marine and inland salt works may be expected to increase steadily during the period of the Plan, the increase in the output of the Mandi mines cannot be so steady.

(b) *Recommendations.*—The following recommendations are made for the planned development of the industry:—

(i) The Salt Expert Committee's recommendations should be implemented as early as possible, particularly those relating to the consolidation of small holdings into economic units with a minimum area of 100 acres each on a voluntary basis by forming them into co-operative societies, and the adoption of more scientific methods of production by supplying technical advice to the private salt works and by setting up model factories in the country. For early implementation of this recommendation the Salt Department should be reorganised on the lines recommended by the Salt Experts Committee, and strengthened on the technical side. Apart from the implementation of the Salt Experts Committee's recommendations and the development projects relating to the existing Government salt works and the Mandi mines, no further development scheme is recommended during the period of the Plan.

(ii) Attempts should be made to increase the average size of the salt pans so that it would be possible to introduce mechanical harvesters for collecting salt, and also to mechanise those operations which involve drudgery and physical discomforts to labour such as lifting of brine, bulk transport of salt, etc.

(iii) The present system by which stocks of salt are expected to be maintained through reserves should be retained and enforced, and relaxed only when production becomes considerably in excess of the total requirements.

(iv) As an experimental measure, 50 per cent. of the quotas allotted to the district nominees for distribution, should be allotted directly to the trade in all areas where the District Nominee System is in force at present, provided the State Governments concerned agree, as they are directly responsible for the detailed distribution within their States. The State Governments should co-operate with the Centre in working out the scheme.

(v) The balance of income from the salt cess left over after meeting all administrative expenses should be utilised for the development of the salt industry. Moreover, the payment of the cess should be made compulsory for all producers, irrespective of whether they are licence-holders or not. Further,

a rebate on the cess should be allowed on the salt consumed by industries, especially the chemical industry.

(vi) While normally there should be no need for imports of salt in future, such imports should, however, be allowed whenever, after consultation with the Salt Advisory Committee, it is found difficult to meet shortages in specific areas from indigenous sources. On the other hand, exports of salt should be stimulated in order to encourage the manufacturers to increase production and improve the quality of salt.

(vii) The Salt Experts Committee's recommendation for wet mining and evaporation by thermo-compression should be implemented for working the salt deposits at Mandi.

(viii) Investigations should be undertaken on a priority basis to ascertain the scope for recovering the various by-products along with salt at different works, whether using sea water or inland brine resources. On the basis of such investigations, the recovery of specific by-products should be made compulsory in the case of large manufacturers by making the necessary provision in the licences issued to them. Small units should also be persuaded to recover such by-products wherever possible.

The table below summarises the programme of development of the salt industry during the period of the Plan:—

	Units	1950-51	1955-56
Area under salt cultivation (excluding Mandi mines)	Acres	55,613	65,200
Production	Tons '000 (Mds. '000)	2,647 (72,051)	3,076 (83,729)

40. SUGAR

Consequent on the remarkable development of the sugar industry as a result of the grant of protection in 1932, it has become a major industry in the country. It has a considerable influence on the agricultural economy in so far as it brings additional remuneration to agriculturists who take to the cultivation of sugarcane. In particular, the interests of the cultivators of Uttar Pradesh and Bihar are closely bound up with the development of this industry as these States together account for over 75 per cent. of the total production of sugar in the country. The industry provides valuable by-products which can serve as raw materials for other industries, such as power alcohol, paper, paper board and strawboard. The development of these and other subsidiary industries have a cumulative effect on the extent of employment provided by the sugar industry. Besides making the country self-sufficient in respect of sugar, the industry stood the country in good stead during the war when only negligible quantities of sugar were imported and the industry had to meet all the essential civil, military and industrial requirements.

The sugar industry has, so far, developed in the private sector either on a proprietory basis or with the help of the managing agency system. The only exception to this is in some of the former Indian States, in which the State Governments substantially contributed to the development of the industry by financial participation and in other ways.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—In 1931-32, there were only 32 sugar factories in the country, but since then there has been a striking increase, the number of factories producing white sugar having increased to 158 by 1951. Seven of these came into existence in the post-war period. Of the total number of factories in existence, 138 and 141 were in operation during 1949-50 and 1950-51 respectively and produced 975,000 and 1·16 million tons of sugar. In addition to the 158 factories mentioned above, there are 2 more under construction, which may be expected to go into production during 1952-53.

The rated capacity of the industry depends on a number of factors, the important of which are:

(*a*) the daily cane-crushing capacity of each factory;

(*b*) the duration of the crushing season which depends on the availability of cane;

(*c*) the quality of the cane;

(*d*) the efficiency of operation in a factory; and

(*e*) the number of units working in each season.

On the basis of an average operating season of 120 working days and assuming a recovery of 10 per cent. sugar, the rated capacity of the 158 factories in the country is estimated at 1·54 million tons of sugar per annum. From the figures of the State-wise distribution of the industry given in the table on the next page, it will be apparent that at present the sugar industry is largely concentrated in Uttar Pradesh and Bihar, the number of factories in these States being 72 and 30 respectively, which together possess a capacity to produce nearly 1·15 million tons of sugar per annum.

State-wise distribution of the sugar industry

	Vaccum pan factories in existence	
	Number	Daily cane crushing capacity in tons
West Bengal	4	1,925
Bihar	30	27,865
Uttar Pradesh	72	67,484
Punjab	1	400
Orissa	2	350
Madras	16	8,942
Bombay	15*	9,225
Chief Commissioners' States (Ajmer and Bhopal)	2	1,100
Kashmir	1	600
PEPSU	2	2,650
Mysore	1	1,400
Madhya Bharat	6	3,200
Greater Rajasthan	2	1,100
Hyderabad	3*	1,550
Saurashtra	1	350
Travancore-Cochin	1	500
Vindhya Pradesh	1	100
TOTAL	160	128,741

The actual production was far below the rated capacity of the industry up to 1950-51, being nearly 1·006 million tons in 1948-49, 975,000 tons in 1949-50 and 1·1 million tons in 1950-51. However, with the increased cane supply during 1951-52 on account of increased acreage and low *gur* prices, a total production of 1·485 million tons was estimated to have been achieved in that year.

The size of the factories operating in the country varies widely from 50 tons to over 2,000 tons of cane crushing capacity per day. While the size of a factory requires to be determined on the basis of the possible daily cane supplies throughout the season, it is generally accepted that factories with a minimum cane crushing capacity of 800 tons per day should be considered as economic units. On this basis, there are at present nearly 80 factories in India which should be regarded as uneconomic. It may be contended that certain economies in operation could be secured by working even smaller units for longer periods. While this may be possible under certain conditions, it might be more economic to start with a unit of minimum economic size and work it on a proper basis for the maximum duration of the season.

(b) *Capital and labour.*—The capital invested in the sugar industry is roughly estimated at Rs. 60 crores of which about Rs. 20 crores is fixed capital and Rs. 40 crores working capital. It must be pointed out that a number of second-hand units imported from other countries were installed in the early years and some of these units have been in operation continuously for long period and require replacement.

The labour employed in the sugar factories is roughly 135,000 skilled and unskilled workers.

(c) *Raw materials.*—The principal raw material required is sugarcane. Its consumption in 1949-50 was about 10·0 million tons for a production of 975,000 tons of sugar.

* One factory is reported to be under construction in each case.

The value of the sugarcane consumed by the industry comes to about Rs. 45 crores. The acreage under sugarcane and the quantity of cane grown during the last few years were as follows:—

Year	Acreage under sugarcane ('000 acres)	Quantity of cane grown ('000 tons)	Quantity of cane crushed by sugar factories ('000 tons)
1947-48	4,056	58,170	10,911
1948-49	3,752	48,690	10,117
1949-50	3,624	49,380	9,901
1950-51	4,138	54,620	11,330*

It is clear from the above that generally only 20 to 25 per cent. of the total cane grown in the country is consumed in the manufacture of sugar, the rest being utilised for *gur* manufacture or miscellaneous purposes. For achieving increased production of sugar in future it might, therefore, be necessary either to utilise a larger proportion of the cane grown in the country for working the sugar factories or to increase the yield per acre and/or the area under cultivation of sugarcane so as to make more can available for the sugar factories.

Other important raw materials, including fuels, and their approximate consumption for the production of 975,000 tons of sugar in 1949-50 were:—

Lime and limestone	85,000 tons (expressed as limestone.)
Sulphur	5,400 tons
Coal	100,000 ,,
Coke	9,500 ,,
Firewood	5,700,000 ,,

Except sulphur which has to be imported, all the other materials are of indigenous origin. The sugar industry at present consumes less than 10 per cent. of the sulphur imported for all purposes. Coke is used in the burning of limestone where the carbonatation process is used, while coal and firewood are required as subsidiary fuel in factories which have other demands for their bagasse or whose steam efficiency is so low as to necessitate the use of additional fuel over and above their entire output of bagasse. The quantities of the above raw materials required depend on the quality of sugarcane used which shows comparatively wide variations from region to region in the country. Although small quantities of sulphur are also used in the finishing stages of the carbonatation factories, sulphur is required mainly by those operating by the sulphitation process.

(d) *Imports and exports.*—The imports of sugar into the country were large in the pre-protection period, being of the order of 940,000 tons during 1929-30. Subsequently with the steady development of the industry in the country, imports were almost completely stopped. However, to meet the acute shortage of sugar in the country a quantity of 58,848 tons was imported during 1950-51 and 1,202 tons in April 1951. According to the Hawaiian International Sugar Convention, exports of sugar from India were not permitted for a long time so that even during 1939-40, when a bumper production was achieved in the country, the surplus could not be exported. Lately, however, restricted exports of sugar to the extent of a few thousand tons per annum have been taking place to some of the neighbouring countries. Recently the Central Government have permitted an export

* Estimated on the basis of proportionate consumption of sugarcane in 1949-50.

of 50,000 tons of sugar out of Governments' controlled stocks held in factories. One of the main problems, which may limit the exports in the future even when surplus sugar may be available is the high cost of production as compared with other exporting countries.

(e) *Estimated consumption and requirements.*—The *per capita* consumption of sugar in the pre-war period was 6·6 lbs. During 1950-51, on the basis of a production of 1·1 million tons of sugar being consumed by a population of 355 millions, the *per capita* consumption worked out at about 7 lbs. These rates of consumption of white sugar in India should be compared with the *per capita* consumption of sugar in other countries of the world which range from 15 to 55 lbs., the only exception being Austria which in the post-war years has come down to a figure as low as 8·8 lbs., although the pre-war *per capita* consumption in that country also was of the order of 25 lbs. While making this comparison, however, it has to be borne in mind that in addition to the above *per capita* consumption of white sugar, *gur* amounting to nearly three times the quantity of sugar is also consumed in the country, so that the total *per capita* consumption of sugar and *gur* together is not much behind that of the sugar consumption in other countries. On the basis of a population of 385 millions and of a production of 1·5 million tons of sugar in the country by utilising the entire rated capacity available, the *per capita* consumption of white sugar can be increased to 8·7 lbs. by 1955-56. This quantity combined with the consumption of *gur* at the present rate might be deemed sufficient under present economic conditions.

II. Problems of the Industry

The main problem responsible for the short-fall in sugar production in recent years has been one of cane supply. The sugar factories in Uttar Pradesh and Bihar are in a number of cases situated so near each other that there is competition between them for cane. In addition, with strict control over the cane prices payable by sugar factories, there has arisen keen competition from *gur* producers also. The absence of restrictions on the manufacture, price and movement of *gur* and the lack of control over the price of cane paid by the *gur* industry have enabled *gur* production to be increased to the detriment of sugar production.

The sugar season has also become shorter in Uttar Pradesh and Bihar, because the cane cultivators are anxious to cash their crops early and do not have the desire to phase the harvesting to suit the sugar industry. Lack of planning for adequate cultivation of the early, medium and late ripening varieties has also prevented the necessary quantities of suitable cane becoming available for meeting the requirements of all the factories throughout a reasonably long season. On account of competition between the *gur* and sugar industries, some of the sugar factories are obliged to start early crushing, utilising unripe cane to the detriment of cost and efficiency, and consequently in the latter part of the season sufficient cane is not available to enable the factories to continue operation.

The industry has also been complaining of the prices fixed on the basis of the Srivastava scale which, according to the industry, has become out of date. The Central Government have recently appointed a committee to revise the scale on the basis of up-to-date data relating to manufacturing costs collected from representative factories. In the determination of the cost of sugarcane payable to agriculturists, it has been urged that the freight incurred on supplies of cane drawn from far-off centres by rail required necessary consideration. In addition to providing adequate transport facilities round about the different factories for easy movement of cane, the industry desires that the cane cess

collected in some of the States should be entirely utilised for cane development in those States only.

In spite of the long period of protection enjoyed by the sugar industry and the present status it has achieved in the economy of the country, there is considerable scope for improving the standards of efficiency so as to enable the industry to bring down its costs and to be in a position to meet foreign competition in due course.

In the present world situation, the problem of meeting the full increasing requirements of sulphur may offer certain difficulties and this should be given necessary consideration in the shifting of old and the planning of new sugar factories. If the locations are suitable from the standpoint of supplies of limestone, preference should be given to refining by the carbonatation process; improvement in operating efficiency might also bring down the consumption of sulphur in the existing factories.

Another important matter is that of the fuel consumption in a number of factories and the necessity of effecting improvements so as to save surplus bagasse and make it available for the development of other industries. In factories favourably situated for the use of alternative fuels, such as coal or wood, a detailed examination is necessary to determine the extent to which such factories could take to alternative fuels and make their entire bagasse available for the development of paper and board industries.

Several sugar factories do not have adequate covered storage facilities for molasses and consequently it becomes difficult to maintain supplies of the proper quality of molasses to the alcohol industry.

III. Programme of Development

(a) *Existing programme.*—In 1948, under the sugar industry expansion plan, the Central Government allotted to different State Governments a definite number of new sugar mills which could be licensed by them for being established within their territories. The selection of sites and parties for the setting up of these new units was left to the respective State Governments. A total of 27 new units were allotted in this manner by the Central Government. Of these 7 have already come into production and 2 more units are expected to commence operation in 1952-53, so as to increase the total rated capacity to 1·55 million tons. The main reasons responsible for the failure so far to fulfil the expansion plan to a greater extent have been:

(i) the inadequate supplies of cane to the existing sugar factories and the difficulties faced by them acting as deterrent to the promotion of new ventures; and

(ii) the high prices of capital equipment at present and the difficulty of quick deliveries.

The experience of sugar production in the 1951-52 season, when, with the increased cane available, the production reached the level of 1·485 million tons, shows that the target fixed for 1955-56 can be achieved with the existing capacity.

(b) *Recommendations.*—(i) In the present state of development of the industry in the country, the problem of facilitating full production in the existing units is of greater importance than that of establishing new units, involving heavy capital expenditure. But if the full requirements of cane of all the existing factories are met, so as to enable the idle sugar factories also to operate fully over an average crushing season of 100 days during the years 1951-53, it should be possible to maintain sugar production at 1·3 million tons

which would be sufficient for the targets of consumption for the next two years. Further, by maintaining the rate of progress in the supply of cane and gradually increasing the duration of the season to 120 days during the latter part of the period of the Plan, it should be possible to ensure an annual production of 1·5 million tons of sugar with the existing rated capacity. In the circumstance, there seems to be no necessity for new capacity to be installed during the next two years.

The plans for sugarcane cultivation envisage an increased output of sugarcane equivalent to 703,000 tons of *gur* to be secured by intensive cultivation alone. The additional production of sugarcane in the different States is envisaged as under:—

Additional production targets for sugarcane (1951-56)

States	Sugarcane ('000 *gur* tons)
Uttar Pradesh	410
Bombay	80
Madras	80
Punjab	70
Bihar	50
Other States	13
TOTAL	703

The prospects of additional supplies of sugarcane to the sugar industry for achieving the above targets are thus reasonably assured.

(ii) Another part of the development programme should consist in enabling some of the sugar factories at present located in areas where sufficient cane supplies are not available to shift to other areas in the same State or even outside the State depending on facilities for the supply of cane. A careful examination by an expert committee of all the factories which did not work or worked at low capacities during the preceding seasons due to inadequate supplies of cane is necessary for determining the factories which should be shifted from their existing locations. It is understood that some assistance in the form of railway facilities for shifting factories, issue of import licences for new machinery and the extent of financial help, if any, to be given to such factories is already under examination by the Government. It is necessary to work out and finalise such arrangements as soon as possible for helping the industry to shift the necessary factories to new locations and achieve full production.

(iii) The process of manufacture is another aspect requiring careful technical examination particularly in regard to new factories. Consistent with the availability of adequate quantities of limestone at the new locations, the question of adopting the carbonatation process or any other technique which would reduce the requirements of sulphur should be carefully examined.

(iv) The State Governments should arrange to utilise the entire cane cess collected by the factories for cane development and help to meet the full requirements of early, medium and late ripening varieties of cane to the sugar factories to enable the industry to work at least for 100 days per season during 1951-53 and 120 days per season during 1953-56.

(v) Cooperative societies for cane supply should be reorganised to enable proper coordination between cane cultivators and sugar factory management in the matter of harvesting and supply of cane to the factories.

(vi) Facilities should be given to the industry to secure adequate supplies of machinery for replacement and maintenance and also for stepping up the capacities of the uneconomic units at the time of replacement or modernisation, consistent with the possibility of increased cane supplies being made available in each area.

(vii) The arrangements should be made for a careful examination of the factors affecting cost of production with a view to revising the Srivastava formula.

(viii) The Government should periodically review the question of control over production, price and movement of *gur* and sugar, for the healthy development of the sugar as well as the *gur* industry.

(ix) If cane supplies to the factories are suitably reorganised to enable them to operate at full capacity for 100 days in a season during 1952-53 and for 120 days during 1953-56, no new sugar factories are necessary. In the event of surplus cane being available in any area, after meeting the full requirements of the existing factories, specific schemes for new factories or substantial expansion of existing units may be permitted after careful examination of each case.

The table below summarises the programme of development of the sugar industry during the period of the Plan:—

	Unit	1950-51	1955-56
Number of factories	..	158	160
Annual rated capacity	Million tons	1·54	1·55
Actual production	„ „	1·12	1·50

41. VEGETABLE OILS

India is one of the most important producers of oilseeds in the world and is consequently a large producer of vegetable oils as well as an exporter of oils and oilseeds. The following figures show the average production of different varieties of oilseeds in recent years along with their world production:—

	Average Indian production (lakh tons)	As percentage of world production
Groundnut	30·0	36 per cent
Castor seed	1·2	26 ,,
Linseed	4·0	15 ,,
Sesamum	3·0	26 ,,
Cotton seed	13·0	13 ,,

Some of the other countries which are large producers of oilseeds are China-Manchuria, the U. S. A., the U. S. S. R. and Argentine. At present, when there is an acute shortage of oils and fats, oilseeds contribute considerably to this country's economic strength.

I. Brief Survey of the Industry

The manufacture of vegetable oils had for long been an important rural industry. Remarkable expansion in oil production has taken place during the last thirty years as a result of the increasing demand for edible oils from the growing population and the demand for vanaspati, soap, paints and varnishes and other industries, apart from the demands for exports to other countries. But with the expansion of the urban population and the growth of large industries in urban areas consuming oils as raw materials, the centre of oil production in the country has shifted to large towns and cities and this has affected prejudicially the position of the village oil industry.

At the present time, the oil milling industry shows varying degrees of mechanisation from the most efficient and up-to-date presses and expellers down to rotary mills, improved *ghanis* and traditional *ghanis*. The efficiency of oil extraction, therefore, varies considerably depending on the type of machinery used. The village *ghani* even now has a place in the rural economy because of the low initial capital outlay, the possibilities of utilising the bullocks during the slack season for operating *ghanis* and the fact that the local needs for oil and cake can be met by it more readily. It has to be recognised that local traditions and the seasonal character of rural occupations have contributed to the continuance of this cottage industry.

(a) *Location, rated capacity and production.*—It is difficult to estimate precisely the present rated capacity of the entire oil milling industry comprising the large-scale mills and the village *ghanis*. According to the latest census of the Development Wing of the Ministry of Commerce and Industry, the number of the more important large-scale mills engaged in the production of edible oils in 1951 has been estimated at 174 with a rated capacity of about 580,000 tons of oil per annum on a daily single shift operation of 8 hours. These are distributed in different States as shown in the table on next page.

Rated capacity of oil mills on the basis of single shift operation of 8 hours per day

(Refers only to edible oils)

	Number of Units	Rated capacity (in terms of oil produced) Per month (Tons)	Per annum (Tons)
1. Assam	23	1,275	15,300
2. West Bengal	10	5,274	63,288
3. Bihar	21	4,342	52,104
4. Bombay	8	3,596	43,152
5. Delhi	2	305	3,660
6. Hyderabad	2	*N.A.*	*N.A.*
7. Madhya Pradesh	12	2,720	32,640
8. Madras	14	6,239	74,868
9. Madhya Bharat	8	1,129	13,548
10. Mysore	4	1,225	14,700
11. Orissa	1	370	4,440
12. Punjab	3	913	10,956
13. PEPSU	2	306	3,672
14. Rajasthan	2	178	2,136
15. Saurashtra	4	3,162	37,944
16. Travancore-Cochin	9	1,306	15,672
17. Uttar Pradesh	49	15,884	190,608
TOTAL	174	48,224*	578,688*

In addition to the large oil mills mentioned above, a considerable number of smaller mills and about 3 lakh *ghanis* are distributed in different parts of the country. The *ghanis* are estimated to have a crushing capacity of approximately 13·69 lakh tons of oilseeds.

The following table extracted from the Indian Oilseeds Statistics published by the Indian Oilseeds Committee indicates the quantities of the various oils and oilcakes produced in 1939-40 and from 1944-45 onwards:—

Production of vegetable oils and oilcakes

(Quantity '000 tons)

	Groundnut		Rape and Mustard		Linseed		Seasame		Castor		Total		
	Oil	Cake	Oil	Cake	Oil	Cake	Oil	Cake	Oil	Cake	Oil	Cake	
												Edible	Non-edible
1939-40	420	631	243	493	62	127	121	181	18	31	864	1,432	31
1944-45	716	1,074	232	472	81	165	112	168	37	64	1,178	1,879	64
1945-46	643	965	202	409	44	89	112	167	34	59	1,035	1,630	59
1946-47	760	1,141	222	451	80	161	102	153	27	47	1,191	1,906	47
1947-48	694	1,042	226	459	106	215	111	167	38	66	1,175	1,883	66
1948-49	638	958	204	413	122	248	94	141	38	64	1,096	1,760	64
1949-50	634	950	220	445	†	..	†	..	39	67	1,113	1,775	67

The above statistics show that considerable expansion took place in the production of groundnut oil, linseed oil, and castor oil during the second world war. Production during

* Refers to capacity of only 172 units
† Other oils—220
N. A.—Not available

the post-war period fluctuated considerably and reflects to some extent the variations in oilseed production.

(b) *Capital and labour.*—The capital invested in the organised section of the industry is estimated at Rs. 30 crores and the number of workers at 28,000.

(c) *Raw materials.*—The most important oilseeds consumed in large quantities for the production of oils are groundnut, linseed, rape and mustard, castor seed and sesamum seed. Small quantities of cottonseed and mohwa seed are also crushed for the production of oil. Depending upon local supplies, the village *ghanis* also produce small quantities of neem and other oils, but the quantities of minor oilseeds crushed in the country are not large.

(d) *Imports and exports.*—Groundnut oil, linseed oil and castor oil constitute the bulk of exports while cocoanut oil is the principal item of imports. The following table shows the imports and exports of oil during the last four years:—

	Imports (tons)				Exports (tons)			
	1948-49	1949-50	1950-51	1951-52	1948-49	1949-50	1950-51	1951-52
Groundnut oil	*N*	*N*	*N*	*N*	36,760	28,960	82,270	21,065
Linseed oil	*N*	*N*	*N*	*N*	9,471	7,362	5,664	25,338
Castor oil	*N*	*N*	*N*	*N*	13,020	4,922	25,530	23,913
Cocoanut oil	7,656	30,700	18,070	28,900	668	*N*	*N*	*N*
Others	237	3,464	1,073	1,471	4,442	3,848	6,636	18,757
TOTAL OF OILS	7,893	34,164	19,143	29,371	64,361	45,092	120,100	89,073

N.—Negligible

(e) *Estimated consumption and requirements*—(i) *Consumption as edible oil.*—The demand for vegetable oil mainly arises from its use as edible oil to meet the requirements of fats in human nutrition. The actual consumption of all fats for edible purposes is difficult to assess because, apart from vegetable oils, a number of other fats are also consumed for which statistics are not available. The Nutritional Advisory Committee (1946) recommended that 2 ounces per day should be the minimum *per capita* consumption of fats in this country. On this basis, the total annual requirements of fats of the entire population in the country would come to about 7·0 million tons, as against the present estimated consumption of 1·2 to 1·3 million tons of fats based on a *per capita* consumption of 0·35 ounces per day. In assessing the quantity of fats consumed at present, it has to be remembered, however, that there are some subsidiary sources from which the fat requirements are supplemented, particularly in the diet of the non-vegetarian section of the population. Assuming that the present trend of population continues during the period of the Plan, the requirements of an additional population of 20·0 million by 1955-56 would come to 70,000 tons of oils and fats even on the basis of the present level of consumption.

(ii) *Consumption as industrial raw material.*—The consumption of vegetable oils in industries has increased considerably since the last war. This increase in consumption for non-edible purposes is particularly noticeable in the development of the soap, and paints and varnish industries. Castor oil consumption as a lubricant has also registered considerable expansion. The break-up of demand for vegetable oils in the principal industries (excluding food industries) has been estimated as shown on the next page.

Industrial consumption of vegetable oils

(Vanaspati industry excluded)

		1939-40	1949-50
Soap	Tons	30,000	63,000
Paints and varnish	„	15,000	30,000
Lubricant	„	15,000	25,000

The industrial demand for vegetable oils is expected to go up considerably as a result of the development plans of the soap, paints and varnish and other industries. The additional demand for major oils in 1955-56 is expected to be of the order of 100,000 tons.

(iii) *Demand for exports.*—An examination of the export statistics of oilseeds and oils shows that whereas the trade in the case of the latter has expanded considerably, export of oilseeds, particularly of groundnut and linseed, has declined appreciably. Owing to the prevailing shortage of fats and oils all the world over, the pressure of foreign demand in recent years tended to push up prices in the domestic market and the Government had, therefore, to impose countervailing export duties on oils and seeds (Rs. 300 per ton on groundnut oil and Rs. 150 per ton on groundnut seed). The export duty on groundnut oil was abolished in April 1952 to counteract the slump in prices in foreign markets. It is difficult to forecast the export demand for vegetable oils as foreign countries prefer to buy oilseeds rather than oils and in a buyer's market it might be necessary to export oilseeds should circumstances necessitate such a step. Even at present, bilateral trade agreements provide for exports of oilseeds to certain countries and this contingency has to be borne in mind in recommending export targets.

The following table indicates tentative export targets for oilseeds and oils. These have necessarily to be flexible depending as they do on conditions of demand for oils and oilseeds in foreign countries:—

	1950-51	1952-53	1955-56
Oilseeds ('000 tons)	203	50	50
Oils („)	100	170	170

II. Problems of the Industry

The most important problem confronting the large-scale mills is the shortage of oilseeds which makes a fuller utilisation of the rated capacity difficult. On the other hand, the village oil crushing industry, which provides a large volume of employment in rural areas, is languishing due to competition from large-scale mills and lack of working capital. The absence of cooperative organisations whereby the *telis* could obtain their requirements of raw materials at reasonable prices and could market their product in competition with the large-scale oil mills is the most serious handicap of this section. The *ghanis* used by the *telis* in the villages do not always give a high recovery of oils; and technical advice and guidance with a view to increasing the efficiency of oil extraction are essential.

III. Programme of Development

(i) *Targets of production and common production programme.*—The targets of vegetable oil production are closely linked with the supplies of oilseeds envisaged under the Agricultural Plan. According to this Plan, the production of oilseeds would increase by 400,000 tons over the estimated production of 5,103,000 tons in 1950-51. As a result, the availability of oil is expected to increase from about 1,113,000 tons in 1949-50 to

about 1,272,000 tons by 1955-56. The total supply of vegetable oils of all varieties, including about 110,000 tons of cocoanut oil, is expected to be about 1·38 million tons by 1955-56.

The production of vegetable oils by *ghanis* is capable of providing increased employment in rural areas if the cottage sector is properly organised and looked after. This development with its implication in respect of greater employment is of considerable importance during the period of the Plan, and is intended to be ensured through the formulation of common production programmes between large-scale oil mills and the *ghanis*. Such programmes drawn up for the development of the village oil industry and referred to in Chapter XXIV of the Report envisage that the crushing of oilseeds by *ghanis* should be increased from the present estimated figure of 1·0 million tons to 1·38 million tons by 1955-56. Simultaneously improvements in the methods of oil crushing by *ghanis* are also envisaged which will increase the recovery of oil. In calculating the yield of oil from *ghanis* an increase of about 2 per cent. has been assumed over the present average figure of 35-36 per cent. On this basis the production of *ghani* oil is expected to increase from 350,000 tons to 510,000 tons. While the expansion of the village *ghani* industry will have the effect of reviving one of the important rural industries, it will leave large-scale oil mills short of their requirements of the major oilseeds. A partial solution of this problem will be provided if the large-scale oil mills take to the crushing of cottonseed wherever facilities for such a change-over exist.

(ii) *Recommendations*—(a) *Development of the cottonseed oil industry*.—The development of the cottonseed oil industry in this country has not been significant. The production of this oil is estimated at present at about 5,000 tons which means the utilisation of only about 50,000 tons of cottonseed as against available supplies of about 1·0 to 1·1 million tons. Taking into consideration the remarkable development of the cottonseed oil industry in the United States and the fact that unrestricted expansion of oilseed production in the country is limited by the competing demands on land for raising the output of other agricultural products, cottonseed offers great possibilities as a raw material for the oil industry. Hitherto, several factors have impeded the development of cottonseed crushing in the country. Some of these factors are mentioned below:—

(1) Cottonseed crushing requires the preliminary operation consisting of delinting and dehulling the seeds. Consequently, it does not lend itself to efficient manufacture through ordinary *ghanis* which are used for the expression of oil from other oilseeds. The installation of delinting equipment increases the capital cost of an oil mill and makes the cost of production high unless a market is simultaneously found for the cotton linters obtained in the process of delinting.

(2) Owing to the prejudice of the cultivator, it has been difficult to persuade him to use cottonseed cake as cattle feed in place of the whole oilseeds which are at present being used to feed cattle.

(3) Cottonseed oil is a semi-drying oil and darkens rapidly on keeping and special refining of the oil with the help of a mixture of bleaching earth and activated carbon is necessary before it can be made attractive for edible purposes. Whereas activated carbon is not necessary for bleaching other edible oils, it is quite essential in the case of cottonseed oil. The difficulty of procuring activated carbon from other countries has also impeded, to a certain extent, the development of cottonseed crushing.

While the utilisation of cottonseed for the production of cotton linters and oil has to be assigned an important place in the long-range development of the vegetable oil industry, the pace of development during the period of the Plan cannot be accelerated considerably because of the difficulties already mentioned which will have to be gradually overcome. Further, the finances of the State Governments during the next five years will not make it possible for them to render any substantial assistance to private enterprise in developing this industry. Given proper conditions, the resources of cottonseed that would become available by 1955-56 in different parts of the country as shown in the table below would be sufficient for the production of 100,000 to 140,000 tons of oil based on the collection and utilisation of the entire quantity of cottonseed produced in the country:—

Production of cotton and cottonseed in India

(1 bale of cotton would produce ⅓ ton of cottonseed)

	1950-51		1955-56	
	Cotton ('000 bales)	Cottonseed ('000 tons)	Cotton ('000 bales)	Cottonseed ('000 tons)
Assam	12	4	12	4
Bihar	3	1	3	1
Bombay	803	268	1,078	359
Madhya Pradesh	510	170	680	227
Madras	348	116	528	176
Orissa	2	1	2	1
Punjab	196	65	346	115
Uttar Pradesh	45	15	85	28
Hyderabad	260	87	460	153
PEPSU	175	58	255	85
Rajasthan	114	38	164	55
Madhya Bharat	219	73	311	104
Mysore	33	11	41	14
Saurashtra	216	72	222	74
Bhopal	4	1	10	3
Kutch	4	1	5	2
Other States	27	9	27	9
Indian Union	2,971	990	4,229	1,410

The cottonseed industry can be assisted in various ways and some of these measures are indicated below:—

(i) duty-free import of delinting machinery;

(ii) licences for the expansion of oil mills or the establishment of new mills might be given to units crushing cottonseed;

(iii) provision of special facilities for obtaining activated carbon;

(iv) levy of differential excise duty on vanaspati produced entirely from cottonseed oil;

(v) education of the farmer in favour of using cottonseed cake as cattle feed;

(vi) reduction in railway freight on cottonseeds which contain only 14 to 18 per cent. oil in comparison with 40 to 45 per cent. oil content in other oilseeds; and

(vii) reduction in export duty on cottonseed oil and linters.

While there should not be any restriction on the expansion of cottonseed oil manufacture, special and immediate encouragement should be given to the establishment of a few plants, capable of producing a minimum of 7,500 tons of cottonseed oil and 5 million lbs. of cotton linters simultaneously. This is desirable with a view to meet the demand for cotton linters from the rayon industry during the period of the Plan. The location of these plants should take into account the possibilities of cotton linters being utilised in rayon factories as alternative raw material to wood pulp. The capital investment, including working capital, required for achieving the production suggested above is estimated at Rs. 60 lakhs. In this connection it may be stated that the Sundata Cottonseed Utilisation Ltd. have imported part of the machinery for a cottonseed oil mill of 75 tons crushing capacity per day to be installed at Hubli. It is expected that the plant will go into production before the end of 1952 with an initial capacity of 12 tons per day which would be progressively stepped up to 75 tons per day by the beginning of 1954.

(b) *Introduction of solvent extraction processes to secure higher overall recovery of oils from oilseeds.*—In view of the limited supplies of the principal oilseeds from which oil can be produced, it is necessary to encourage the oil mill industry to adopt modern techniques with a view to achieving an increased yield of oil from a given quantity of oilseeds. A recognised method of increasing the yield of oil is to adopt stagewise extraction of oil from the oilseed, the two stages comprising cold extraction of oil from the seeds followed by solvent extraction of the residual cake. By adopting this process, a superior quality of edible oil is obtained in the first stage and the overall recovery of oil is increased through the method of solvent extraction in the second stage. The capital cost of a project based on the above process would be on the high side but it can be justified in large-scale mills in the context of the high prices for oil ruling at present.

Although several large-scale producers of oil have under consideration schemes for introducing solvent extraction plants, so far no appreciable progress has been made by them. This is due to several reasons. There has been a divergence of opinion on the optimum quantity of fats in oilcakes used for the feeding of cattle. It has been contended by one school of thought that the higher the oil content, the greater is the energy supplied to the cattle through the oilcakes used for feeding them. It is, therefore, not considered desirable to reduce the oil content of cakes by the adoption of the solvent extraction processes which would bring down the percentage to as little as 1 to 2 per cent. This is countered by another section of research workers on the strength of experience in the use of oilcakes for feeding animals in western countries, since oilcakes do not constitute complete feed and have in any case to be fed along with other feeding stuffs with or without blending. This question is, at present, under the investigation at the Indian Veterinary Research Institute of the Government of India.

But even if a higher proportion of oil in the cakes is necessary for animal feeding under Indian conditions, there is still scope for the introduction of the solvent extraction technique with a view to increasing the production of oil, because the entire quantity of oilcake produced in the country is not at present being used as cattle food and a substantial portion of it is diverted as an organic manure for the soil. If arrangements can be made for using solvent-extracted cake exclusively as manure, there is no reason why the solvent extraction processes should not be introduced. Given the possibility of diverting solvent-extracted cake to the soil through some suitable method, permission should be given for the introduction of the solvent extraction process in the large-scale oil mills in view of the wide gap between the requirements of oils in future years and the supplies

expected to become available. It has been decided that pending the results of investigations that are being made solvent extraction plants up to a maximum capacity of 200,000 tons of cake per year would be permitted by the Government and the solvent-extracted cake would be arranged to be used for fertiliser purposes only. With the new solvent extraction plants envisaged during the period of the Plan it should be possible to augment the available supplies of oil by about 15,000 tons annually. The financial investment for achieving this increased production through the new technique might be of the order of Rs. 60 lakhs.

(c) *Wider utilisation of neglected resources of oil-bearing materials.*—There are possibilities of increasing the production of oil in the country if the resources of *Neem, Mohwa, Karang* and *Marotty,* which grow wild, are properly mobilised. As the trees producing these oil-bearing materials are widely scattered in forests and uncultivated waste lands, it is evident that the exploitation of these resources would depend on an efficient system of organisation for the collection of these materials. The production of oil would have to be organised on a decentralised pattern based on the exploitation of the resources at the localities where they are available. It is difficult to fix any targets of production in regard to these minor oilseeds and the plans for cottage industries formulated by State Governments should include the exploitation of these natural resources.

The table below summarises the programme of development envisaged during the period of the Plan:—

	1949-50 (tons)	1955-56 (tons)
I. Production of vegetable oils*		
(i) By large-scale mills (ii) By cottage units	1,113,000	1,272,000
(iii) By solvent extraction process	..	15,000
(iv) Cottonseed oil	5,000	12,500
I. Exports of oil	45,000	170,000

* Excluding cocoanut oil

42. VANASPATI

The manufacture of vanaspati was started in the country in 1930 and it received a great impetus during the second world war when the general shortage of vegetable fats and the large requirements of the armed forces created a big demand for vanaspati. Another reason for the increased demand was the wider adoption of vanaspati as an edible fat by the middle classes owing to its cheaper price, attractive appearance, granular texture and odourless and tasteless character. The spectacular development of this industry is demonstrated by the increase in the number of factories from 2 in 1935 to 10 in 1939, 19 in 1945 and 46 in 1950. Like the match industry, the vanaspati industry is also an important source of excise revenue to Government at the present time.

I. Brief Survey of the Industry

(a) *Location, rated capacity and production.*—At the beginning of the period of the Plan—April 1951—there were 48 factories engaged in the manufacture of vanaspati with an annual rated capacity of 333,228 tons. In addition there were 13 factories under construction for which the necessary plant and machinery have been imported. The number of factories now under construction has come down to 10 and the licences of two companies have been cancelled.

The State-wise distribution of these factories at the beginning of 1952 and their rated capacity is shown below:—

	In production	Under construction	Annual capacity (tons)
Bombay	14	1	133,400
Saurashtra	3	1	22,500
West Bengal	7	1	56,000
Bihar	1	..	4,960
Orissa	1	..	7,600
U. P.	4	..	42,468
Delhi	2	..	13,500
Punjab	1	..	3,000
PEPSU	..	1	3,000
Madras	7	5	52,900
Mysore	4	..	10,800
Hyderabad	1	..	7,500
Travancore	1	..	1,200
Madhya Pradesh	2	..	19,500
Madhya Bharat	1	1	10,500
TOTAL	49	10	388,828

The production of vanaspati increased from 18,000 tons in 1935 to 145,000 tons in 1946. Production during the last three years has been as follows:—

1948-49	143,110 tons
1949-50	168,360 „
1950-51	152,600 „

Of the total production of 171,000 tons in the calendar year 1950, Bombay accounted for 72,600 tons, Bengal for 22,400 tons, U. P. for 26,900 tons and other areas for 49,100 tons.

The shortage and the high cost of oils has stood in the way of increased production of vanaspati and at present, there is a large percentage of installed capacity unutilised.

(b) *Capital and labour.*—The capital invested in the vanaspati industry is about Rs. 22½ crores. The industry directly employs over 15,000 workers and it is estimated that in addition about 60,000 workers are employed indirectly.

(c) *Raw materials.*—Vegetable oils constitute the chief raw material of the vanaspati industry. Groundnut oil is, at present, extensively used for hydrogenation in the production of vanaspati. Though cottonseed oil has been used extensively in other countries like the United States, its use in the manufacture of vanaspati in this country is small in comparison with the large resources of cottonseed available.

In addition to vegetable oils, caustic soda, hydrogen and small quantities of make-up nickel catalyst are required in the vanaspati industry. A certain amount of bleaching earth is used for refining the oil, the quantity of which depends on the quality of the oil being refined. Finally, tin plate is used for containers.

The principal raw materials required for the production of 175,000 tons of vanaspati are approximately as follows:—

	Quantity (tons)	Value (lakhs of Rs.)
1. Groundnut oil	195,000	32,76
2. Sesame oil	9,000	1,80
3. Tin plate	19,250	189·25
4. Caustic soda	1,750	12·25
5. Bleaching earth	2,500	13·75
6. Nickel formate	175	11·76

During the year 1950 when the production of vanaspati was 171,600 tons, the quantities of different oils used for hydrogenation were:—

1. Groundnut oil	193,222 tons
2. Sesame oil	9,672 „
3. Cocoanut oil	3,284 „
4. Cottonseed oil	1,803 „
TOTAL	207,981 „

Nickel catalyst, iron oxide and a few other materials are imported. Bleaching earth until recently was being imported, but its manufacture has now been undertaken by a firm in Bombay which is marketing it under the name of "Actival". Hydrogen required for the process of converting the oil into vanaspati by hydrogenation is prepared by the steam-iron process as well as by the electrolysis of water. A few of the vanaspati factories associated with caustic soda plants obtain their hydrogen as a by-product of electrolytic manufacture of caustic soda.

(d) *Imports and exports.*—Though there was substantial import of vanaspati in the form of hydrogenated fats before 1930, it was considerably reduced in the subsequent period as a result of the establishment of plants for its manufacture in the country. There has been no import of vanaspati since 1939-40.

Export of vanaspati has been negligible; it cannot be sold in foreign markets in large quantities because of its high price. The export markets for this material are neighbouring countries like Burma and Malaya, where a considerable number of Indians are settled as immigrants. Since partition the market in the territories comprising Pakistan has been lost. During the year 1950, exports of vanaspati to neighbouring countries amounted to 494 tons.

(e) *Estimated consumption and requirements.*—The demand for vanaspati is mainly from the middle-class population and is estimated at about 150,000 tons a year. As consumption of vanaspati is interchangeable with that of other fats and edible oils, the demand is liable to vary depending upon the relative prices of different edible oils and vanaspati. It is estimated that the demand will increase to about 190,000 tons a year by 1952-53 and to about 300,000 tons a year by 1955-56.

(f) *Control over vanaspati.*—No proper control was exercised over the production, quality and price of vanaspati until 1945, though the prices were fixed for defence contracts in 1943 and subsequently in 1944, and the price structure covered civil supplies as well. Between February 1945 and March 1947, the prices were fixed on a 'cost plus' basis. However, with the rapid development of the industry, Government realised the necessity of exercising a certain measure of control over it. A large number of factories were indiscriminately springing up and the price of vanaspati was disproportionately high. The quality of the product delivered to the civilian market was also uneven and it was feared that this would have deleterious effects on the health of the consumers. Consequently, the Food Department of the Government of India took over the control of vanaspati, and the Vegetable Oil Products Control Order was promulgated in August 1947. The Vegetable Oil Products Controller appointed under the Control Order is empowered to exercise control over production, distribution, stocks, sale, quality and price of vanaspati. The control has been so far exercised only with respect to prices and quality, while distribution is left to the manufacturers and trade. The control is three-fold: (i) quality, (ii) development and (iii) price.

(i) *Control over quality.*—Under the Vegetable Oil Products Control Order, 1945, issued under the Essential Supplies Act, the Controller prescribed a specification to which all vanaspati has to conform. The specification aims at making vanaspati clearly distinguishable from ghee and less liable to use as an adulterant, free from harmful and injurious ingredients and easily digestible.

In order to enforce quality standards, the Government have appointed inspectors who collect samples of vanaspati from the producers and from the markets in various areas. Factories which infringe the regulations relating to quality are prosecuted. The Government favour marketing vanaspati in sealed containers so that it reaches the consumer in a pure condition.

(ii) *Control over development.*—The Government's policy is not to encourage any further expansion of the vanaspati industry because the present capacity is adequate. Although no ban has been placed on the installation of additional factories, control over further expansion is secured by refusing import licences, etc., for the import of machinery.

(iii) *Control of prices.*—The Government have fixed the maximum selling price of vanaspati. The country has been divided into four zones and prices of vanaspati are fixed on the basis of the average raw groundnut oil price in the particular zone *plus* a fixed charge for processing, cost of tins, excise

duty, railway freight and profit. Prices are adjusted periodically with the changing oil prices.

(g) *Criticism of vanaspati.*—Recently, there has been considerable criticism of vanaspati and public agitation against its use. It has been mainly criticised as an easy adulterant of ghee. Conflicting opinions have also been expressed on the effects of vanaspati on health. A number of experiments carried out in various laboratories to study the nutritive and other aspects of vanaspati have led to the following conclusions:—

(1) In comparative feeding experiments carried out at four different research centres on rats for three generations with raw groundnut oil, refined groundnut oil and vanaspati of melting point between 37° C. and 41° C., the results indicate that there is no deleterious effect produced by vanaspati as compared with raw or refined oil.

(2) Human feeding trials carried out at four different centres also indicate that vanaspati of melting point 37° C. has no harmful effect as compared with raw groundnut oil.

The specification for quality control provides a further safeguard against the inclusion of harmful ingredients. It requires that:—

(i) Vanaspati shall not contain any harmful colouring, flavouring or any other matter deleterious to health.

(ii) Vanaspati on melting shall be clear in appearance and its taste shall be free from staleness or rancidity.

The specification further requires the range of melting point of vanaspati to be between 31° C. and 37° C. Vanaspati of this specification, according to the opinion expressed by the Scientists' Committee, is digestible.

As regards the criticism based on the harmful effect of traces of nickel present in vanaspati, it has been proved that even if all the fat which is normally taken came from the hydrogenated variety there would be little risk of any adverse effect from its prolonged consumption.

To prevent adulteration of ghee by vanaspati, the Government have made it obligatory on all vanaspati manufacturers to incorporate a minimum percentage of sesame oil (5 per cent.) in vanaspati so that adulteration of ghee with vanaspati even up to 10 per cent. can be easily detected. Sale or stock of ghee and vanaspati on one and the same premises is prohibited. Adulteration, however, is a widespread malady and has to be avoided by more vigorous enforcement of the powers vested in the Government.

II. Problems of the Industry

(1) The most important problem which confronts the vanaspati industry at the present time is the high price of groundnut oil which constitutes the principal element of cost in the price of vanaspati. Consequently, the demand has not expanded as rapidly as it would have if the price of oil had been lower. It has been contended that the vanaspati industry is exercising a pressure on the limited supplies of groundnut oil in the country and has been responsible for the increase in its price. It must be pointed out, however, that the high prices of oil in the domestic market are closely linked with prices in the international market and the world-wide shortage of edible oils and fats. Of late, a downward trend in the oil market has been noticed and this should be of some assistance to the vanaspati manufacturers.

(2) With the increasing utilisation of the installed capacity, the vanaspati industry will make increased demands on indigenous resources of groundnut oil. This may tend to push up the price of groundnut oil, because, according to the Agricultural Plan, the additional tonnage of groundnut expected during the period of the Plan is less than the additional requirements of the vanaspati industry. In the circumstances, the vanaspati industry should explore the possibility of utilising cottonseed oil in place of groundnut oil. The following points have to be considered in connection with the use of cottonseed oil in vanaspati manufacture:—

(*a*) the colour of cottonseed oil and the greater difficulty encountered in refining it, and

(*b*) the non-availability of adequate quantities of cottonseed oil.

As regards (*a*), the problem of refining cottonseed oil has been solved through the use of a mixture of bleaching earth with activated carbons and with better technical control and modified refining procedures. The preparation of refined cottonseed oil free from its objectionable colour in the natural state should not, therefore, present much difficulty. As regards (*b*), the resources for the production of cottonseed oil are available domestically in the form of cottonseed which is at present being fed directly to cattle. The cottonseed available in the country is capable of producing about one lakh tons of oil. Though special delinting and dehulling machines have to be installed for preliminary operations before the cottonseed can be fed to the expellers for the production of oil, which would involve some additional investment by the oil-milling industry, it should be possible for the oil mills favourably situated in regard to supply of cottonseed to interest themselves in the manufacture of cottonseed oil provided a regular and sustained market is ensured by the vanaspati industry. The use of cottonseed oil in admixture with groundnut oil is prevalent in some of the vanaspati factories at the present time and it is stated that in some other countries 100 per cent. cottonseed oil is utilised in the production of the hydrogenated product. The problem is, therefore, mainly one of providing the necessary incentives to the vanaspati industry to make increasing utilisation of cottonseed oil, a step which would be in the national interest, as it would minimise the pressure on the price of the groundnut oil and, at the same time, lead to the utilisation of valuable resources which have, so far, been neglected and wasted.

III. Programme of Development

(a) *Existing programme.*—The Advisory Committee appointed to consider the future expansion of the vanaspati industry in their Report of 1945, laid down an initial target of a little over 400,000 tons for undivided India to be reached by 1950. This figure is more or less of the same order as the rated capacity envisaged by 1955-56, *viz.*, 388,828 tons, which, however, is very high in comparison with the estimated demand. The development programme of this industry must, therefore, aim at increased utilisation of the rated capacity already in existence. Actual production is envisaged at 190,000 tons in 1952-53 and 300,000 tons in 1955-56.

(b) *Recommendations.*—(i) After the completion of the 10 units under construction, it is not necessary to have additional capacity in the country for the production of vanaspati. In view of the fact that there is a wide gap between actual production and the rated capacity, the industry should aim at a fuller utilisation of the available capacity during the period of the Plan.

(ii) With the increase in the production of vanaspati, increasing quantities of groundnut oil will be required by the vanaspati industry. In view of the influence which large-scale demand from the vanaspati industry would exert on the prices of groundnut oil, the vanaspati industry should utilise, wherever possible, increasing quantities of cottonseed oil. For facilitating this change-over to cottonseed oil from groundnut oil, the Government should consider the possibility of levying a lower excise duty on vanaspati manufactured entirely from cottonseed oil. This step would enable the vanaspati industry to meet the increased cost of refining cottonseed oil and provide an incentive for the development of cottonseed oil in the country.

The table below summarises the programme of development of the vanaspati industry during the period of the Plan:—

	1950-51	1955-56
Number of factories	48	59
Annual rated capacity (tons)	333,228	388,828
Actual production (tons)	152,600	300,000

MGIPC—L—1 Planning—28-4-53—5,000.

List of Agents in India from whom Government of India Publications are available.

AGRA—
English Book Depôt, Taj Road.
National Book House, Jeomandi.
Wadhwa & Co., Raja Mandi.

AHMEDABAD—
Chandra Kant Chiman Lal Vora, Gandhi Road.
Indradhanu Book House Ltd., Mission Road, Bhadra.
New Order Book Co., Ellis Bridge.

AJMER—
Banthya & Co., Ltd., Station Road.

AKOLA—
Bakshi, Mr. M. G.

ALLAHABAD—
Central Book Depôt, 44, Johnston Ganj.
Kitabistan, 17-A, City Road.
Law Book Co., Post Box No. 4, Allert Road.
Ram Narain Lal, 1, Bank Road.
Supdt., Ptg. & Stationery, U. P.
University Book Agency (of Lahore), Post Box No. 63.
Wheeler & Co., Messrs. A. H.

ALWAR—
Jaina General Stores, Bazaza Bazar.

AMBALA CANTT.—
English Book Depôt.

AMRITSAR—
Peoples' Book Shop, Court Road.
Sikh Publishing House Ltd., Court Road.

BANARAS—
Banaras Book Corporation, University Road, P. O. Lanka.
Students Friends, University Gate.
*Hindi Pustak Agency.

BANGALORE—
Book Emporium, Messrs. S. S., 118, G. H. Extension, Basavangudi P. O.
Vichara Sahitya Ltd., Balepet.

BAREILLY—
Agarwal Bros., Bara Bazar.
Sahitya Niketan, Pulkazi.

BARODA—
Good Companions.

BIKANER—
Goyal & Co.

BOMBAY—
Clifton & Co., P. O. Box No. 6753, Sion, Bombay-22.
Co-operators' Book Depôt, 9, Bakehouse Lane, Fort.
Current Book House, Hornby Road.
Dutt & Co., P. O. Box No. 6014, Parel.
Lakhani Book Depôt, Bombay-4.
National Information & Publications Ltd., National House.
New Book Co., Kitab Mahal, 188-90, Hornby Road.

BOMBAY—*contd.*
Popular Book Depôt, Grant Road.
Supdt., Government Printing & Stationery, Queens Road.
Sydenham College Co-operative Stores, Ltd., 90, Hornby Road.
Taraporevala Sons & Co., Messrs. D. B.
Thacker & Co., Ltd.
Tripathi & Co., Messrs. N. M., Princess Street, Kalvadebi Road.
Wheeler & Co., Messrs. A. H.

CALCUTTA—
Chatterjee & Co., 3, Bacha Ram Chatterjee Lane.
*Hindi Pustak Agency, 203, Harrison Road.
Hindu Library, 69-A, Bala Ram De Street.
Lahiri & Co., Ltd., Messrs. S. K.
Newman & Co., Ltd., Messrs. W.
R. Cambray & Co., Ltd., Kent House, P-33, Mission Row Extension.
Roy Chowdhury & Co., Messrs. N. M., 72, Harrison Road.
Sarkar & Sons Ltd., Messrs. S. C., 1/1/1C, College Square.
Standard Law Book Society, 41, Beltala Road, Bhowanipur P. O.
Thacker, Spink & Co. (1933) Ltd.

CHAMBA—
Chamba Stationery Mart.

CHANDAUSI—
Mr. Madan Mohan.

CUTTACK—
Press Officer, Orissa Secretariat.

DEHRA DUN—
Jugal Kishore & Co.

DELHI—
Atma Ram & Sons, Publishers, etc., Kashmere Gate.
Bahri Brothers, 188, Lajpat Rai Market.
Federal Law Depôt, Kashmere Gate.
*Hindi Pustak Agency.
Imperial Publishing Co., 3, Faiz Bazar, Darya Ganj.
Indian Army Book Depôt, 3, Darya Ganj.
Jaina & Bros., Messrs. J. M., Mori Gate.
M. Gulab Singh & Sons.
Metropolitan Book Co., Delhi Gate.
N. C. Kansil & Co., Model Basti, Lane No. 3.
New Stationery House, Subzimandi.
Technical & Commercial Book Depot, Students Park, Kashmere Gate.
Youngman & Co. (Regd.), Egerton Road.

FEROZEPUR—
English Book Depôt.

GORAKHPUR—
Halchal Sahitya Mandir.

GWALIOR—
Jain & Bros., Messrs. M. B., Sarafa Road.
Mr. P. T. Sathe, Law Books Dealer.

HYDERABAD (DECCAN)—
Hyderabad Book Depôt.

INDORE—
Students and Studies, Sanyogitaganj.

*For Hindi Publications only.

List of Agents—*contd.*

JAIPUR CITY—
- Garg Book Co., Tripola Bazar.
- Vani Mandir, Sawai Mansingh Highway.

JAMMU (TAWI)—
- Krishna General Stores, Raghunath Bazar.

JHANSI—
- Bhatia Book Depôt, Sadar Bazar.
- English Book Depôt.

JODHPUR—
- Kitab Ghar, Sojati Gate.
- Mr. Dwarkadas Rathi.

JULLUNDUR CITY—
- Excelsior Book Depôt, Baz Baharwala.

KANPUR—
- Advani & Co., The Mall.
- Sahitya Niketan.
- Universal Book Stall, The Mall.

KOLHAPUR—
- Maharashtra Grantha Bhandar.

LUCKNOW—
- J. Ray & Sons (India), Ltd., Hazarat Ganj.
- Law Book Agency, 29-A, Kachery Road.
- New Oxford Book Co., Jehangirabad Palace.
- Universal Publisher Ltd., Plaza Building, Hazarat Ganj.
- Upper India Publishing House, Ltd., Literature Place, Aminuddaula Park.

LUDHIANA—
- Lyall Book Depôt.
- Mr. Dharam Prakash, B.Sc., Banjiman Road.

MADRAS—
- Divine Trading Co., 22, Namashivaya Mudali Street, Triplicane.
- Higginbothams.
- K. Krishnamurthi, Mount Road.
- Presidency Book Supplies, 8-C, Pycrofts Road, Opposite Victoria Hostel, Triplicane.
- Supdt., Government Press, Mount Road.
- Varadachary & Co., Messrs. P.

MANGALORE—
- U. R. Shenoy & Sons, Car Street.

MEERUT CANTT.—
- Mr. Dharam Prakash, B.Sc.

MEERUT CITY—
- Prakash Educations Stores, Near Tehsil.
- University Book Depôt, Near Tehsil.

MYSORE—
- J. Nanumal & Sons, Lansdowne Building.

NAGPUR—
- Supdt., Government Printing, Central Provinces.

NEW DELHI—
- Amrit Book Co., Connaught Circus.
- Bhavnani & Sons, Connaught Place.
- Bodh Raj Marwah, Shop No. 65, Pussa Road Market, Karol Bagh.
- Chifton & Co., Original Road, Karol Bagh.
- Empire Book Depôt, 278, Aliganj, Lodi Road.
- English Book Store, G-Block, Connaught Circus.
- Faqir Chand Marwah & Sons, No. 1-A, Regal Building, Connaught Circus.

NEW DELHI—*contd.*
- Harikishan Das Bedi, R.S. 22, Annexe Feroze Shah Road.
- J Ray & Sons (India), Ltd., 2, Regal Building.
- Jain Book Agency, Connaught Place.
- Jayna Book Depôt, Chapparwalla Kuan, Karol Bagh.
- Oxford Book & Stationery Coy., Scindia House.
- Ram Krishna & Sons (of Lahore), 13/13, Connaught Places
- Saraswati Book Depôt, 15, Lady Hardinge Road.
- Sikh Pubilshing House, Ltd., 7-C, Connaught Place.

PATIALA—
- Jainco, Booksellers, etc., Bazar Shaha Nashin.

PATNA—
- Sohan Singh & Sons, Pirmohani, P. O. Kadam Kuan.
- Supdt., Government Printing, Bihar, P. O. Gulzar Bagh.

PATNA CITY—
- *Hindi Pustak Agency.
- Lakshmi Trading Co., Padri-ki-Haveli.
- Raghunath Parshad & Sons.

POONA—
- Deccan Book Stall, Fergusson College Road.
- Express Book Service, East Street.
- International Book Service, Deccan Gymkhana.

PUDUKKOTTAI—
- P. N. Swaminathan Sivam & Co., Perumal Vilas, Bazar Street.

RAJKOT—
- Mohan Lal Dosabhai Shah.

RANCHI—
- Ideal Book Store, Near Paristhan Theatre, Main Road.

ROORKEE—
- Cambridge Book Depôt.

SHILLONG—
- Supdt., Assam Secretariat Press.

SIMLA—
- J. Ray & Sons (India), Ltd.
- Azad Kitab Mahal, Stall No. 13.
- Minerva Book Shop, Regal Cinema Building.
- Sunder Das & Sons, 141, Lower Bazar.

SIROHI—
- National Trading Co.

SURAT—
- Sree Gajan Pustakalaya, Tower Road.

TRICHINOPOLY FORT—
- Krishna Swami & Co., Messrs. S., Teppakulam.

TRIVANDRUM—
- International Book House, 33, Valia Chalai.

UDAIPUR—
- Mewar Book Depôt.

UJJAIN—
- *Manakchand Book Depôt, Patni Bazar.

VELLORE—
- Venkatasubban, Mr. S., Law Booksellers.

*For Hindi Publications only.

PUBLISHED BY THE MANAGER OF PUBLICATIONS, DELHI.
PRINTED BY THE GOVERNMENT OF INDIA PRESS, CALCUTTA, INDIA,
1953